

AVIATION WEEK

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NOV. 21, 1955

50 CENTS



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The Terrier, the Navy's new all-weather anti-aircraft missile, is now being produced in quantity by Convair in the Naval Industrial Reserve Ordnance Plant of the U.S. Navy's Bureau of Ordnance. Responsible for supplying our Navy with the most effective weapons, the Bureau of Ordnance participates in vast programs of research, development, testing, and procurement. The Bureau of Ordnance facility at Pomona, California, managed and operated by Convair, is an outstanding example of government and industry working together to produce weapons systems for the defense of our country.

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FACTS

about

NEW DEPARTURE BALL BEARINGS

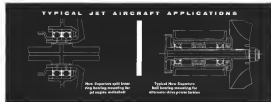
Research develops aircraft bearings for extreme speeds and temperatures

With jet aircraft flying higher and faster than ever before, ball bearings are being called on to meet increasingly severe conditions. For example, bearings that support the turbine wheels are subjected currently to temperatures up to 500° F. at high speeds and heavy thrust loads.

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NEWS DIGEST



New Sweepback for Vulcan

The second prototype of the Avia Vulcan V3777 has appeared with a redesigned leading edge. Avia has been added to the leading edge of the wing to produce a sharper sweepback at the tip. The company said it decided upon the sweepback to "make the fullest operational use . . . of non-powered regions (the Busek Gyroplane) soon to be available."

Domestic

U.S. and Canada will construct a new radar warning network stretching from the tip of Labrador to the northern tip of Newfoundland. The network—one-third of its cost is to be borne by Canada, two-thirds by the U.S.—will be an extension of a radar net being constructed by the U.S. off the Atlantic Coast.

Litton Industries announced that production has started on a lowest, thinking digital computer (AW Aug. 22, p. 75) with built-in automatic and military applications. The computer will sell for approximately \$10,000 and can handle "almost any scientific problem made from data handling."

Hamilton Standard Division of United Aircraft Corp. will become a major source of supply for parts of the Nike antiaircraft missile. Avco officials and Hamilton Standard will produce "at least" 10 different parts for the missile, including fins, ballheads, springs and bearings. Prime contractor for the Douglas Missile is Western Electric Co., Inc.

Elwood R. Quesada, World War II, commander of the USAF's fighter force in Europe, resigned as general manager of Lockheed Aircraft Corp.'s Missile Systems Division at the climax of a dispute with Lockheed executives over design and development procedures. Quesada joined Lockheed after serving with the Air Force in 1953 with the rank of lieutenant general.

North American Aviation, Inc., signed a technical assistance agreement with Comarciones Aeronauticas Sociedad Anonima (CASA), of Madrid. North American will provide technical advice and help in the repair and overhaul of F-86F's recently turned over to the Spanish government by the USAF. R. M. Hansen, North American senior representative, and eight other technical advisors will set up classrooms in Spain for CASA employees.

Yemen made the 20th anniversary of the first scheduled flight over a stage seven-of-the run by Pan American World Airways' China Clipper from San Francisco to Manila via Honolulu.

Financial

Lockheed Aircraft Corp. earnings for the last nine months of the year dropped to \$6.73 per share from \$6.01 per share for the same period of 1954. Lockheed President Robert A. Gross attributed the lower profits to development costs on two new transport models (the 1490A and the Electra replacement) and lower military production. Missile Systems Division sales for the same month period, however, were more than \$16 million, double the volume for the entire year of 1954.

R. F. Goodrich Co. reported net sales for the first nine months of 1955 at \$141,924,516, a 20.1% increase over the \$466,495,115 reported during the same period of last year. Direct and indirect sales to the U.S. Government

accounted for 5.8% of the total net sales. Estimated net income for the nine months amounted to \$31,145,212 (\$1.65 a common share) after provision for all costs. The same figure for the 1954 period was \$27,571,729.

International

The first Canadian-designed guided missile, the Velsat Glave, was placed on display by Canada for the annual meeting of the Air Industries and Transport Association in Quebec. Canadian reported that the expensive missile has been successfully fired from F-86 Sabers and Avro CF-80s.

British Ministry of Supply officials announced that two rocket plus turbojet powered interceptors are under development, confirming Avrocan Wren's report of Nov. 15, 1954, p. 11. The two rocket interceptors are the Saunders-Roe SR-57 and the A. V. Roe Avro-738.

The Fokker Aviation Co. announced that its Fokker Delta E research plane attained supersonic speeds in a climb.

Hindustan Aircraft Ltd., manufacturer of the first Indian-built trainer (the HT-32), announced plans to put the firm on the international market. Demonstrations of the plane, which is already in operation with the Indian air force, are scheduled for Bangalore, Bangkok, Colombo, Fuzhou, Kuala Lumpur, Singapore and Melbourne.

AVIATION CALENDAR

- Nov. 21—Connecticut Aircraft Fleets
Third National Congress (aviation only),
Providence (Providence, Philadelphia)
- Nov. 18-Dec. 2—Air Transport Ass'n., Air
line Finance & Accounting Conference,
30 Christie Street, New Orleans, La.
- Dec. 3—American Aircraft Society, 7th
Annual Meeting, American Museum of
Natural History, New York, N. Y.
- Dec. 12—California Association of Air-
port Engineers Meeting, Fair Hotel,
San Francisco, Calif.
- Dec. 13—Florida Aeronautical Conference
& Flight Clinic, sponsored by
Tampa Chapter of Commerce and
Tourism Airport Authority, Tropic, Ave.
Dec. 6-7—Professional State Pilot's Assn.
convention, Carter Hotel, Cleveland
- Dec. 15—National Association of Aircraft
Technicians 10th Annual Congress of American
Technicians, Waldorf Astoria Hotel, New
York
- Dec. 15—MacPherson Engineering & Service
Congress & Aircraft Exposition, open
house by Engineers Joint Council, Public
Auditorium, Cleveland, Ohio
- Dec. 15-17—Felt Meeting, USA National
Communications USSR International Radio
Scientific Union, University of Florida,
Gainesville, Fla.
- Dec. 15—New York's Wright Brothers Lec-
ture, U. S. Chamber of Commerce 8th
Auditorium, West 10 C. Wright Day
Dinner at Statler Park Hotel
- Jan. 1-14—Second National Symposium on
Reliability and Quality Control in Elec-
tronics, sponsored by Institute of Radio
Engineers, Hotel Statler, Washington
- Jan. 7—University of Automotive Engineers,
Annual Meeting, Sheraton-Cadillac and
Statler Hotels, Detroit
- Jan. 19-21—National Aviation Conference
sponsored by Dallas-Fort Worth Chapter
of Institute of Radio Engineers' Group on
Electronic Communications, Dallas, Tex.
- Jan. 22—Society of the Aeronautical
Engineers 21th annual meeting, Statler
Hotel, New York, N. Y. Jan. 23—
Hawaii Night Dinner
- Jan. 25-26—Plant Maintenance & Engineer-
ing Show and Conference, Convention
Hall, Philadelphia
- Feb. 2—National Symposium on Micro-
wave Technology, sponsored by Institute
of Radio Engineers, Andrews & Zappa
patron Group and Theory & Technology
Group, Philadelphia
- Feb. 15—Society of the Plastics Industry,
11th annual National Plastics Dis-
tributors, Hotel Clubhouse Innside
19th, Atlantic City, N. J.
- Mar. 19-21—Society of Automotive Engi-
neers, national production meeting and
show, Hotel Statler, Cleveland, Ohio
- Apr. 9-12—Society of Automotive Engi-
neers, national automatic working, automatic
production forms and aircraft engineering
meeting, Hotel Statler, New York, N. Y.
- May 2—Society of Aeronautical Weight
Engineers, 14th annual conference, Fort
Worth, Texas
- May 14-17—Felt Design Engineering Show,
Convention Hall, Philadelphia. Also
open by Cape & Pott, Inc., 141 Mid-
way Ave., New York, N. Y.



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WHO'S WHERE

In the Front Office

Max G. Allen, Dallas (419)
elected vice president of European opera-
tions for Republic Aviation Corp. Robert
K. Matson will fill Cleveland-based po-
sition as general manager of Republic Avia-
tion International.

Ellis D. Strait, president of Franklin
Duckless Inc., named board member of
Emery Air Freight Corp.

Donald A. Vanden, vice president and
general manager of Remco Corp., Bos-
ton, Mass.

Fred O. Heston, vice president of
Western Helicopters, Ltd., Liberty P.
Garvey, vice president-engineering.

Mark MacIntosh, vice president member
dining at Tied Corp., Sherman Oaks, Calif.

Other changes: James W. Berkman, Jr., vice
president operations, Howard E. Fennell,
assistant treasurer.

Honors and Elections

Dr. Percy G. King, Stamboul Kerkelowski
and **Bernie L. Mosley** received 1915 Flight
Safety Foundation awards for the Air National
Safety Service for distinguished service in
advancing safety education, research.

Dr. Ralph L. Dwyer, director of the Na-
tional Advisory Committee for Aeronautics,
recipient of the Wright Brothers Memorial
Trophy for 1915 administered by the Na-
tional Aeronautics Institute.

J. L. Auer, president of North American
Aviation, Inc., was elected the Canadian
of Most distinguished of the Republic of Italy
for outstanding contribution to aviation.

Arthur E. Kelly, vice president for
Western Air Lines, will lead the national
Air Traffic Conference when he takes office
as president for 1956. Ray Bush of Boeing
International Aeronautics will serve as first vice
president and John C. Johnson of Trans World
Airlines as second vice president.

James K. Johnson received the Dis-
tinguished Civilian Service Award, the
NAVY's highest civilian honor, awarded, for
former service as director of the Aeronautics
Equipment Div. of the Bureau of Aeronautics.

E. R. Fowles, vice president of
Monogram Manufacturing Co., Norwalk,
Conn., and **Norman T. Bunker**, former vice
president of Hughes Aircraft Co., have been
elected to membership in the Committee
of Aeronautics.

Changes

Robert L. Giffith, assistant to the presi-
dent of Delta Air Lines.

William A. Kelly, assistant to the presi-
dent of H. M. Sawyer & Son Co.

Kenneth L. Sewer, assistant to the vice
president manufacturing of International
Business Machines Corp.

Robert D. Brown, assistant secretary
treasurer of Fairbanks, Morse & Co.

Ernest C. McLean, legal counsel and
secretary of Mohawk Airlines.

(Continued on page 66)

INDUSTRY OBSERVER

- Lockheed has offered Capital Airlines an Electra turboprop transport powered by Rolls-Royce RB 109 engines. Payment terms are involved very favorable for Capital. The RB 109 is rated at 4,470 shaft horsepower with 3,775 city of the Allison 501 engines which will be used in the Electra ordered by American Airlines.
- Goetz is stepping up its sales program abroad for its Metropolitan transport through an extensive program of the single-engine performance of its two-engine plane. Goetz told the Metropolitan is a study which for some Europe traffic. Personal sales helped at Goetz transport will keep it in production for at least another year.
- England has abandoned its plans for a long range jet transport with the cancellation of order for the Vickers Armstrong V-590. This means the first jet transport regular of new-type transatlantic operations will be the Boeing 707 or the Douglas DC-8.
- Canada Engineer FS-13 turboprop, rated at 20,000 hp, on level static thrust, has completed more than 110 hr. of test stand running. Lack of alternate test facilities in Canada has forced Canada to use NACA's Lewis Lab for test runs.
- U.S. Air Force F-4D squadrons in England are still the backbone of Britain's all-weather defense. Operational use of the Sabre, controlled by the RAF Fighter Command, paired up the effectiveness of single-seat fighters and controlled official RAF operations on the membership of such aircraft for British defense.
- Bristol Aircraft Co. is completing work on the Bristol Fighter as soon as possible and issuing a substantial part of its staff working on helicopters to temporary operations in order to concentrate on production of the Bristol Britannia. Bristol Controls Aircraft Corp. is not expected to start scheduled service with the Britannia 100 seats before next August. One problem has been lack of success in carrying out driving tests on the aircraft.
- First evolution of the Gloster Javelin night fighter is a simulated combat was judged satisfactory by the Royal Air Force. Two Javelins, operating in a defense exercise, intercepted and "destroyed" three Canberra targets 800 miles off the British coast.
- Strategic Air Command is making the task of its Boeing KC-97 tankers with different colored Goosie lights so that each B-47 at night refueling center can be assigned to hook up with a tanker marked by a specific color. Object is to avoid mid-air collisions similar to one which occurred over the Gulf of Mexico when two B-47s closed on the same red-light tanker and collided. One bomber exploded and was lost.
- Performance of the 18-cylinder Adair engine, standard armament for the RAH Hunter, is still excellent. Very little tactical change has been done with the weapons. Informal sources believe Neville Doolan's accident is a Hunter occurred during long tests with the Adair engine.
- First heavy aluminum entrance press built in the U. S. is now in operation at Kaiser Aluminum & Chemical Co.'s Holtrop, Md., plant. The 50,000-ton press, built by Lowry Holtrop, Inc., is the first of two that Kaiser will operate under the Air Force heavy press program.
- Investigation of the House Armed Services Investigating Subcommittee has looking into complexity of Navy plans that the Grumman F9F-7 Cougar is underpowered and dangerous to fly. The result is powered by the Allison J35 turboprop.
- Hamilton Standard propellers continue to be considered for use on the Lockheed Electra turboprop transport which is powered by four Allison 501 engines.



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Washington Roundup

Shrinking ATA

Plans for shrinking rather than expanding the Air Transport Association have been laid down by Harold L. Pearson, ATA president. Pearson wants to show the members a return on their ATA investment. ATA has an annual budget of about one tenth of 1% of the industry's billion dollar gross income.

Pearson's first proposal has been to recommend the discontinuance of the four ATA regional operations offices at New York, Kansas City, Fort Worth and Los Angeles. He contends these offices should be closed because they perform no useful function and are an expense.

Travel funds for the ATA staff, which are regularly appropriated by the board of directors, have been sharply cut by Pearson for the last two months of 1955. He also has abandoned plans to move from ATA's cramped, second apartment office building because he expects personal reduction in ATA staff to reduce the company.

The only staff addition included in Pearson's plan is to hire Robert B. Winkelman as a vice president to head a new state affairs department. Winkelman, formerly a one-time Republican congressman from Delaware, is now serving as a congressional liaison capacity for Secretary of Labor James F. Mitchell.

These changes are among those to be proposed by Pearson at the regularly scheduled semi-annual ATA board of directors meeting Dec. 15.

Leaks at CAB

A series of information leaks on confidential Civil Aeronautics Board matters is causing increasing concern to Chairman Ross Rader. The latest incident occurred around the Denver Service Unit, details of which were common knowledge in the airline industry before the decision became public. One Denver newspaper published a detailed and accurate account of the matter revealed in the decision several days before it was released.

Rader has reportedly warned CAB personnel about such security lapses since he took office eight months ago. The Federal Bureau of Investigation may be called in if there is another leak on an important CAB matter.

Rader apparently also is concerned over the pressure applied by the airlines to limit their federal efforts to influence the Board and its staff in their treatment of route cases and other matters. The situation has come to a head over activities in connection with the proposed Southwest-Northeast Case.

The chairman is reported to have warned the Air Transport Union, and then the industry, against possible tactics. Apparently Rader feels the industry should take responsibility for solving itself and has suggested a delay measure for pricing its own services.

Novy Airlift Study

Novy has renewed efforts to improve its supply system by means of use of airlift, including expanded operations with commercial contract air services. A study has been ordered by James H. Smith, Assistant Secretary of Navy for Air, to take a critical look at the present and future requirements in the supply system. The study is being handled in the Office of the Chief of Naval Operations. It will follow along the lines of a study done by Harwood

University for the Air Force, which resulted in USAF's present paper system for speeding its supply system.

Much Ado

A new congressional investigation of State Department "boycott" in foreign affairs, promoted by National Airlines, is likely to fail.

A. G. Hardy, National's senior vice president, has testified that six German Lancers, an Air Force jet, had been sold to Saudi Arabia and thought it would have been profitable if the deliveries had been made to National instead.

The facts seem to indicate that there is little to investigate.

In February Saudi Arabia indicated an interest in new C-119s for the high traffic period from June to August, when Mohammedia makes their religious pilgrimages to Mecca. Congress, State Department and Air Force disapproved this initial indication—turn over C-119s to Air Force order to the Arabian desert. It indicated to deliver delivery as USAF's C-119s.

The Congress was delivered to Saudi Arabia in May and June. Congress withdrew the additional business State Department, noting that other countries in the Middle East were seeking British aircraft, selected the million of U. S. equipment.

In September, National placed a 54 million order for six C-119s for delivery in 1956. Anxious to receive new equipment, National head of the Arabian assignment in November, and Hardy made his public complaint that National should have been given an opportunity to acquire the USAF aircraft. Congress, though, had passed a law which on the Arabian assignment on April 7—four months before National ordered the order. Hardy's accusation during National's objection of "boycott" to a foreign country to the Senate Commerce Committee. But even National spokesmen commented that their complaint "has been blown up out of proportion."

R & D to Small Firms

Count on the House and Senate Small Business Committees to bring sweeping pressure on Defense Department to channel more research and development contracts to small firms.

The new Small Business Administration Act, which became effective Aug. 1, requires the department to report monthly to Congress on the division of research and development work between larger firms and small firms of under 500 employees.

Rep. Wright Patman (D-Tex.), chairman of the House Small Business Committee, said over the reports for July and August showing that less than 5% of total research and development contracts are going to small firms, wrote in Defense Secretary Charles Wilson. "The \$1.5 billion a year for military research and development work... represents a vast subordination of industrial research..."

"These funds handed out to private business firms are in a large sense wasteful gifts. The new product and process development resulting from these projects which are thought to advance to be purely of military usefulness turn out, to a great extent, to have valuable commercial applications..."

—Washington staff

craft under positive control at all times. MAC, ultimately, wants preparations started immediately for the control of all high-altitude traffic when DC-10s and 707s go into service in about three years.

A few participants, including some from CAA, questioned what the status meant and how a clear area was defined. They agreed, however, that even heavy descending of the ATA survey could not detract from the conclusion that the problem was serious.

Bringing the meeting, a genuine dilemma presented on these participants who painted the blackest picture of the collision hazard. The desire to lift CAA, the Civil Aeronautics Board, the Government and the public to lead that programming and budgeting of adequate funds for corrective measures will begin without delay and the fear of scaring the public off the airlines.

Hinging over the meeting, too, was

a report at its latest: "M. G. 'Duke' Bond, assistant vice president of American Airlines and transportation chairman, expressed the feeling of many, 'I am embarrassed, being an optimist in the past and looking the other way coming up on it.'"

ALFA, ATA and Air Force recommended generally similar means to consider in revising traffic control.

Robert Stone, an Eastern Air Lines pilot, summarized ALFA, suggested:

- Revision of VFR ceilings. Spreads of new aircraft have become so great that old concepts are obsolete and saving visibility concerns may be necessary for different categories of aircraft. The group might use low-level rule for helicopters to three miles for light aircraft to seven or eight miles for DC-7s to 10 miles for jets. Horizontal and vertical separation from clouds must be removed.

- Control zones whenever instrument approaches are approved. At several airports it is perfectly legal for aircraft to operate beneath clouds through which visibility decreased to instruments.

"A gentlemanly pilot permits some leeway to himself by his glow and latitude the base of clouds as I make a landing is an open invitation to a near-collision."

- Speed limits in high density traffic areas. "Right here at the Speedway they have traffic rules which make more sense than some of our rules. When the green light is on, the cars make good just as airplanes do on the open airports, but when red lights change, the yellow light comes on and the cars slow down and no passing is permitted. There's a time and place for speed and there's a time and place for descent."

- Positive control of all traffic in the

New York, Los Angeles, Washington and Chicago terminal areas.

James, on behalf of ALFA, suggested several recommendations for consideration of VFR regulations. He reiterated that the "see and be seen" principle was completely outmoded by the density and speed of today's traffic, is frequently pointed out to ALFA.

This places the burden on air traffic control which, he said, "must be capable of control operation in good and bad weather with transmission of critical information quickly along with clearance to deviate from flight course."

He asked for greater use of radar in traffic monitoring, direct communication between pilots and controllers and better display of traffic information at control centers.

ATA has recommended a change in CAA policy, James reported, calling for extension of traffic control restrictions to all types of aircraft in good and bad weather with limited exceptions.

The exceptions would be private aircraft operating under regulation at low altitudes and deviate within strong flights. To reach this goal, the CAA must immediately progress expansion of its capability, incorporating all known devices available and implementing research for new devices.

Visual Limits

Any doubts as to ATA and ALFA observations of the adequacy of the "see and be seen" principle were completely dispelled by Dr. Walter Gardner and Lt. Col. George Emerson of the Wright Air Development Center's Aero Medical Laboratory and Capt. Norman Reed of the Naval Medical Institute. They outlined the physiological limitations of visual observation which pilots have proven in flight.

James and Stone both stated a requirement for positive warning radar.

"It must be possible to build radar which will put the airplane in a sphere of safety so that it can escape along, and the pilot will be certain that he will receive an alarm whenever another airplane enters his sphere," Stone said. There the pilot cannot watch the radar scope at all times. ATA and ALFA believe the device used currently itself will sound an alarm so that the pilot will look at his scope for the information necessary to take evasive action.

SAC officials supported this request. They said that SACs border with using this E-scanning system as a preventive device. Instead into an accident's airspace could strike on the radar scope, warning the crew to begin scanning for a possible collision object. "This is a go-around necessary since a B-47 crew must keep its attention

centered in the cockpit 75% of the time flying the airplane.

Other participants discounted the practicability of need of a warning device. George Johnson, from WADC, of the Weather Flying Branch, suggested that such a device would have to compute and tell the pilot exactly what course action to take and, therefore, would be too complicated. He outlined a concept of traffic control to "designate collisions out of the air traffic control

system" through secondary review of air traffic rules and regulations and improvement in the use of existing equipment. It is perfectly feasible, he said, to establish complete ground control from a central location with positive surveillance of all traffic by radar and secondary position reporting, transmission and printing. A free to report up to a certain altitude would be made available for light aircraft under Johnson's scheme.

Industry Groups Urge Termination Of Renegotiation When Law Ends

By G. J. McAllister

Washington—Termination of the Renegotiation Act when the present law ends in 1958 was demanded last week by the National Industrial Council and the U.S. Chamber of Commerce.

NSIA said that renegotiation is a profit control "device" is a technique which does not foster the mutual confidence of Government and industry in their business dealings.

The Chamber of Commerce said renegotiation has no place in a free economy because it becomes a profit control device which drives low cost, efficient manufacturers away from defense production.

These statements came following recent denunciations by the Renegotiation Board citing the substantial wealth from two aircraft firms—Boeing Aircraft Co. and Trans Aircraft Corp.—as examples of profits earned in 1952 (AW News, 7, p. 12, Nov. 14, p. 30).

These 1952 denunciations have profoundly disturbed the aircraft industry. Profits earned in 1953 and 1954 have not yet been examined by the Board.

Loss Incentive

NSIA pointed out that renegotiation discourages the maintenance of a broad mobilization base. "This is so because renegotiation determines the financial incentive for the best producers to maintain the lowest prices for the Government contract," when the potential rewards of taxing those most likely to commercial production can be so much more rewarding," NSIA said.

The uncertainty of a company's financial status under renegotiation was emphasized by NSIA. The prohibition that no company can plan its future growth and development when it is not certain its best a financial basis which can require two, three

or more years to be finished. "The threat of an undesirable renegotiation should not completely wipe any sound plan of industrial financing."

NSIA pointed out a situation that is possible through renegotiation by the National Board recommendations by the National Board in Washington.

"No small group of men on a Renegotiation Board, regardless of their qualifications, experience, and intelligence, can possibly make judgments on what constitutes fair profits for performance of Government contracts," NSIA said. "It is inherent in a business that negotiation of the information presented on the factors considered the final decision must be arbitrary. The terrible evidence of this, in industry, are the observable differences in profits as it shows up among Renegotiation Boards in doing the same or similar industrial operations."

Recent criticism of Renegotiation Board decisions under the Tamm and Baring cases.

Discrimination Claimed

The Renegotiation Board is one of industry's concerns over its actions, but will not publicly release its facts and reasons for its denunciations. The Board claims its data is a confidential agency under such officials. Thomas C. Coughlin, acting Board Chairman, said: "...We often feel caught in the position of 'Succubus' or 'Whore'." Although the 75% "Benefit" in the Board according to St. Matthew says "Blessed are the merciful for they shall be called the children of God"—that has not been our experience to date."

The Chamber of Commerce cited two cases in support of its contention that renegotiation discrimination against efficient manufacturers.

First company, makes a piece of equipment priced at \$18,000 which a second firm sells the same equipment



TF-102A's First Flight

Canaan's TF-102A side-by-side trainer (AW Oct. 17, p. 39) is shown above taking off from Edwards AFB on its maiden flight and, at right, as it circled after 30 min. in the air. Company officials said the trainers, which also can serve as a tactical weapon, "handle just like the F-105-A." Prototype external differences between the fighter and trainer is the latter's head, mainly nose section. The trainer's principle duty will be to familiarize pilots with the flying and fighting of a supersonic weapon system.



to the Government for \$13,000, but it will still carry a 10% profit on the transaction.

Under the present administration of the Kazakhstan Air, the Chamber and the first company would be sub-

jected to negotiations but the second would have no such restrictions.

The Chamber will the second company, whose major profit represents the cost of inefficiency, would pay the refund if "inefficiency" were a pricing

policy that a profit control means."

There are many more, the Chamber claimed, whose jet light companies have paid negotiations refunds while their inefficient competitors have been allowed.

Sagebrush Maneuver:

Atomic Attack Tests Dispersal Concept

By Claude Witte

Fort Polk, La.—When the first atomic waves were struck in Exercise Sagebrush last week, this large military exercise was opened with a nuclear test of USAF's concept for the dispersal of tactical air forces.

Within a matter of minutes, aggressive planes dropped simulated nuclear weapons on 16 U.S. and French air bases in far north as Louisa AFB, Va. Opening the exercise with an all-out coordinated air ground assault, it will be clear that the aggressive posture was to create a realistic picture of the U.S. air force.

The air attack was made by Martin B-57 light air bombers that dropped the equivalent of 350,000 tons of TNT on the bases scattered over 10 states. It was not intended how many B-57s were used, but seven were intercepted and four shot down by North Atlantic F-100s from the U.S. 3rd Force. Fortunately the entire attack was carried out by not more than 25 aircraft.

Only a few hours before the mock air assault, Maj. Gen. Edward L. Timberlake, Commander of Tactical Air Command's North Air Force and air commander of all U.S. Forces in Exercise Sagebrush, told American Wings that during the entire maneuver TAC units will try not more than 50 air bases in 12 states to test the dispersal and concept.

Dispersal Problem

Gen. Timberlake said the USAF realizes there can be such a thing as over-concentration, and he hopes Sagebrush will help make it clear just how TAC will make the point of dispersing units in employment of the protective concept.

He pointed out, for example, that one of his own bases need be made aware as a home for heavy tanks and equipment units, possibly even service units, that should be moved here by North American F-100 Super Sabres and F-86H Sabrejets.

"We could break it into more units," Timberlake said, "but there is no possibility that we can go too far. The goal is to maintain the movement of control and yet concentrate our forces as much as possible."

Tactical Air Forces set up for Exercise Sagebrush, both capable of delivering nuclear weapons, are Gen. Timberlake's 20th Air Force and the Aggressor's 20th Air Force, commanded by Maj. Gen. Edward L. Underhill. Both Air Forces were moved from the North Air Force and made units of TAC's 80th Fighter-Bomber Wing.

'Commoner's Nightmares'

Combat elements of the two maneuver air forces are widely dispersed as far forward as bases with respect to located for the next in possible nuclear attacks on the air force.

Gen. Timberlake told American Wings that the setup "creates a commoner's nightmare." He pointed out that at one nuclear concentration base were needed between that maintenance, or "mother," status and each of three facilities. In addition, a connection is necessary from the main base to his post operations center and then there are the facilities.

An Aggressor attack such as the one that opened the air test recently would be the answer. If this is a part of business even for a period of hours and some of the units are dispersed as far as B-57s and C, the vulnerability is increased. If a fourth base is added to replace A, a new burden is introduced to the maintenance system.

TAC has been working on this prob-

lem for several years. Gen. Timberlake said, and the last testing situation was "worn wheels," a mobile command base center built in tandem. It can be moved out of a single base.

There are duplicate offices, one at Gen. Timberlake's forward headquarters and a reserve in the rear.

"This is a big improvement over what we had in World War II," Gen. Timberlake said, "but we're still thinking of mobility in terms of wheels. What we need is something in an aircraft, much smaller, more powerful, probably less obvious."

Airborne Command Post

He has a TAC mobile command post, it is a Douglas C-119 with simulated equipment. It can be moved at short notice, always stay with the command. This airborne command post, Gen. Timberlake pointed out, would not completely replace his "worn wheels" concept, but would be a valuable standby in case of emergency.

On the eve of the first air action in Sagebrush, and before Aggressor Forces had made a tactical attack on the bases of Gen. Timberlake and he believed conventional-type weapons will be returned to the battlefield, at least for certain types of air strikes.

For example, it is his knowledge that the Air Force's advance by Aggressor ground forces will be directed and to a great degree. There are about five forward units plus through which they can push with ease. For TAC's defensive operations, the conflict will be a high rate of action with minimum bases of the type used in the Korean war.

"On the other hand," Gen. Timberlake said, "we know very well that the fighter-bomber with nuclear weapons can bring about big destruction. Perhaps we should not concentrate heavily on the multipurpose type of operation but make sure that a few planes get in the target. That is why our operations need to be built to insure the success of the nuclear mission."

Service Cooperation

At the Joint Operations Center there was every confidence at the start of Sagebrush that Air Force and Army officers

Army Bars Troops from USAF Coverters

Ft. Polk, La.—Some U.S. Army personnel have been forbidden to ride in U.S. Air Force helicopters, it was learned here during the early phase of Exercise Sagebrush, post USAF-Army maneuvers. The order, American Wings was told by a source who was based at a level in the Army command, allowed all officers to find out who would be and the reason for the order was unexplained.

USAF Gen. Otto F. Weyand, maneuver director, told American Wings he did not feel he should mention the question because of his present position as head of a joint command.

First indication of the Army order came only in the command when a group of Army troops refused to board a USAF F-101 helicopter for transport from England. AFB to Ft. Polk. The Army troops said they could not ride in a USAF rotary winged aircraft but accepted a flight in a fixed wing C-119 transport.

Practical effect of the order, if it sticks, will be felt when airborne troops are called upon to make the drop in Exercise Sagebrush. The order is in the drop area will be the loading of a USAF combat control team in French F-101s. These House helicopters flown by pilots of the 50th Troop Carrier Group of the 10th Air Force. The team will drop troops over the same jump zone as the C-119s.

After the combat control team is landed, and it is the helicopter to return with the U.S. Army's 10th Air Force, a special group of combat troops who are landed to protect the USAF troops from enemy fire.

Under the Army order, the F-101s will be eliminated and the Army must find another way to get troops into the drop zone in the face of enemy opposition.

were prepared to work in complete cooperation in a large temporary shelter, a simulated air base, a large age defense.

"This JOC is the Air Force facility where the day Tactical Air Force operations are planned and controlled. Here the Air Force staff and field army staff accomplish an operation necessary to insure full cooperation of all phases of integrated operations."

Progress of the tactical command of the bases of the U.S. 3rd Force, can be watched in this office. According to it the Tactical Air Command Center, where all activity in the maneuver is now planned, for action attack or reconnaissance.

First indication of Gen. Timberlake's JOC and the one being used by Gen. Underhill may not come until weeks after Sagebrush is finished. The wings will have an important bearing on future TAC directives and fields of activity for the Army's forthcoming interest in operations interest.

Admiral Cites Need For Good V-2 Defense

San Francisco.—The commander of the Western Sea Frontier and his staff that there is no good defense against V-2-type missiles and that no one has come up with a good defense of one probable percentage of effectiveness against jet bomber attack.

Speaking before a meeting of the National Security Industrial Army, Vice Adm. F. H. Low said a strong plan for greater support and aid the Sea de-

fense against nuclear weapons carried that he is an overwhelming defense against nuclear force.

"The one severe defense, which can be sure of striking first—which is not just an emotional philosophy—but in which our potential enemy that should be made the first blow, he will be the recipient of overwhelming and total attack," Adm. Low said. He added:

"We have great knowledge, no know that against enemies of the V-2 type there is practically no effective defense."

"Against our such number the only solution, and against nuclear weapons a more effective solution, is to devise the means from which they might be launched."

One way, he said, to advance them toward potential enemy targets is to increase the range of our present bombers and missiles. Low said, after exposed targets in Europe, Africa. He suggested that the defense be decentralized and authorized so that each coast location cannot be protected by the enemy.

These moving bases against which Low said long-range aircraft missiles would be ineffective, would make it possible of launching attack and greater mobility and advantage capable of launching ground missiles.

Low said assumed that of nuclear weapons, the most serious would be the field of reconnaissance (intelligence) devices, silicon diodes and transistors, electronic energy amplifiers and optical products all outgrowths of advanced development in the field of electronic physics, computers and guided missiles."

"As for the present," Hughes said, "the sea defense will continue in the field of reconnaissance (intelligence) devices, silicon diodes and transistors, electronic energy amplifiers and optical products all outgrowths of advanced development in the field of electronic physics, computers and guided missiles."

"The new defense will be located at Hughes Aircraft Co. headquarters in Culver City, Calif. C. M. Blum, former national manager of the Civil Air Division of Continental Airlines and Engineering Corp. of Detroit, will manage the defense."

"For the present," Hughes said, "the sea defense will continue in the field of reconnaissance (intelligence) devices, silicon diodes and transistors, electronic energy amplifiers and optical products all outgrowths of advanced development in the field of electronic physics, computers and guided missiles."

USAF Testing Missiles, Engines At Uncompleted Tullahoma Center

By David A. Anderson

Tullahoma, Tenn.—Significant progress in missile and engine testing has been made during the last two years at the Air Force's Arnold Engineering Development Center here. It includes:

- Missile models of the Hughes Falcon air-to-air weapon, the Aero's surface-to-surface Redstone and the nose cone of the Atlas intercontinental ballistic missile have been tested in tunnel E-1 of the Gas Dynamics Facility.

- Eight rocket engines—including two different types of General Electric's J79 scheduled for the upcoming Lockheed F-104 and Convair F-106—have been run through checkout programs in the cells of the Engine Test Facility.

Other developmental testing has been completed on models of the duct inlet system for Republic's F-101 and F-105 fighters. A General Electric ramjet engine is currently operating in one of the ETP cells.

Major facility additions in the last two years include completed test cells

of the Engine Test Facility. These began working in May of 1954.

No new tunnels have been added to the Gas Dynamics Facility since E-1 began its calibration run more than two years ago.

The massive amount of the periodic Propulsion Wind Tunnel is nearing completion, and AEDC personnel expect to start testing late next year. The supersonic tunnel is under construction.

F. H. Richardson, former AEDC Chief of Staff and now its Technical Director, said that construction was about 70% complete. New facilities will be added at the rate of approximately one every six months for the next three years. When completed, no present plans, Richardson said, AEDC will represent about \$300 million in construction and equipment cost.

Other expected starts next year include the 40-in. by 40-in. supersonic Tunnel A of the Gas Dynamics Facility, with an anticipated Mach number range from 1.2 to 5.5; Tunnel B-Minus, a 30-in. diameter supersonic tunnel

designed as a predecessor to Tunnel B, and Tunnel E-2, a duplicate of the 12-in. by 12-in. supersonic E-1, but with a range from Mach 0.5 to an estimated Mach 10.

A major aerospace missile developed for the first cell of the Engine Test Facility makes possible an accurate simulation of a complete flight program for a rocket engine powerplant.

The missile is adjustable to produce variations in the Mach number and angle of attack, so that the entire flight range of a trajectory can be covered. Two flat side walls and two adjustable contour walls, with supporting equipment, make up the wind section.

It weighs about 10,000 lb., can operate in a zone of heavy artillery, yet its control and motion are extremely precise. Motion around one set of pivots changes the Mach number by changing the contour of the supersonic nozzle formed by the flexible walls. Motion around another pivot changes the angle of attack of the flow directed against the rocket engine.

Data produced in the Engine Test Facility and the other operating units of AEDC are fed into one of three ERA-1102 Univac Scientific Systems, made by Engineering Research Associates Division of Sperry Rand Corp.



Conquest 146, test work needed as secondary and experimental, F-46 Sabre. Applying the NACA principle to reduce drag was, Conquest helped the Sabre at top of the fuselage forward of the canopy, along the side through part of the wing root and along the aft half of the fuselage. Results a "wasp waist."



'Wasp Waist' for the Sabre

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Used by the Finnish Air Force for similar operations, OTHER QUADRADAR PURCHASERS: United States Army, United States Marine Corps, United States Air Force, French Air Force, South African Air Force, Irish CAA, Austrian CAA.

In addition, Quadradars will shortly be in operation in Australia, New Zealand, Sweden, Denmark, Belgium and Holland. Never before has a new airplane received such immediate universal acceptance as the proven Gilfillan GCA Quadradar.



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AERONAUTICAL ENGINEERING



Boeing's Tex Johnston Describes . . .

Flight Characteristics of the 707 Airliner

By A. M. "Tex" Johnston
(Chief of Flight Test, Boeing Airplane Co.)

An airplane is put a lot of exacting tests. It actually goes through the air. What I'm going to write here is not opinion as what an airplane of the future should be able to do, but what an airplane of the future has already done.

I would like to make a few comments on certain handling characteristics of the Boeing 707 prototype that I think would be interesting to people at large.

These are based on the experience gained in more than 300 hours of testing the prototype.

We at Boeing have had considerable experience with wingtip vortices. We have encountered no unusual problems with them. The first two were the B-47 and the B-52. Compared with them, the 707 prototype is as good as all respects, and better in some.

Typical characteristics of the 707 are the same as for any typical general airplane.

The climbout and cruise are entirely normal except for a marked improvement, from the pilot's point of view. His duties are considerably reduced due to the simplicity of the instruments and the cockpit layout, which results.

Elimination of superchargers, propeller controls, mixture controls and so forth makes it a lot easier as far as manipulating the airplane is concerned.

The 707 is very maneuverable. Control forces are light. Unlike the B-47, this airplane does not require power control, which means we don't need a backup system and the weight penalty which would be associated with it. With the exception of the spoilers, the airplane's controls are normally operated for lateral, directional and longitudinal control.

Lateral Control

There is enough lateral control with the manual system to fly the airplane in the event of loss of hydraulic pressure in the spoiler system.

A word about the lateral control system specifically—we have gone to the

Johnston in Jets

Tex Johnston began flying multi-engine, four jet aircraft in 1949 when he joined Boeing as project pilot for the B-47.

He flew the 707 on its first flight in early 1952 and on many subsequent test flights.

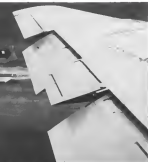
He flew the 707 on its initial flight and for a large part of its test program.

His experimental test flying started in 1952 with Bell Aircraft Corp.

While with the company he piloted the first flights of Bell's RF-81 King Cobra, TF-58 Aardvark, F-45 and F-15.

He also was one of the first pilots to fly the Bell X-1, first supersonic airplane.

Johnston worked with a headquarters flying crew in the early 1950s. Later, before going with Bell, he served as flight instructor for the Army Air Corps and as a ferry pilot in the Air Transport Command.



TAKEOFF—Spoilerons are down, flaps are coming up. Spoilerons represent an approach when flaps are down.

Spoilerons and both



CRUISE—Spoilerons are down, flaps up. From bottom to top: inboard flap, midwing slat, outboard flap, outboard slat.



positive configurations to retain sufficient lateral control effectiveness at high speed. We also needed a drag device for approaches and landings, and we got that "for free" in adopting this lateral control system. The drag device is the spoiler system.

When the spoilerons on both wings are moved in synchrony, they increase drag and improve the handling characteristics at low speeds.

On the B-47, approaches were comparatively flat due to the aerodynamic characteristics of the airplane and the considerable thrust at take-off. Using the lateral control spoiler on the 737 to produce drag, a wide variety of approach angles can be followed. The approach also can be adjusted through use of spoilerons in air brakes. If the approach

path is too high, the application of additional spoiler will bring it down to the correct approach path, after which the additional spoiler can be taken off.

Speed can also be decreased through use of the spoilerons in air brakes.

Control forces felt by the pilot are very light, even at the higher speeds. With one hand it is possible to attain full control without excessive control.

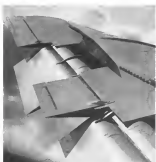
'Most Honest Staff'

Now a third or two about low-speed characteristics when going into a stall. This airplane has the most honest stall of any airplane I have flown. It has adequate stall warning, both clean and with gear and flaps down. As both states, the stall warning range began 10 to 12 knots above stall. It presents

stall first as a tremor in the airplane. As the airplane decelerates, buffeting increases. A visual warning of the aircraft is felt with the airplane clean, and with flaps down, the warning is even more pronounced.

Both clean and with flaps down, the airplane can be stalled power on or power off with stick full back. The most critical condition is with power on since the airplane must be brought into a comparatively more nose-high attitude. If the airplane is allowed to stall lightly while in the still adequate lateral control mode to correct the condition. Also, the directional control remains positive.

The great speed of the Boeing 737 has shown us certain things. There was a need to decelerate the airplane at high



BOEING—Spoilerons are up and flaps partially down. The 737 can safely descend at rates up to 14,000 feet per minute.



APPROACH—Flaps down, spoilerons partially up for added drag. The 737 shows excellent lateral control characteristics.



speed in case of emergency, so the landing gear was designed to be lowered at high indicated air speeds and Mach numbers. It is obvious that, if you control parts and pieces into the wind stream at these speeds, there will be a certain amount of buffeting.

I don't consider that as more than a phenomenon about which the risk engineers will have to be advised in advance. It isn't severe at all, but when the gear is extended at very high speed and high Mach numbers, at altitude, there is more buffeting in the airplane than on slower speed runways.

High-Speed Flatter Tests

Just recently we completed a high-speed flutter investigation. During the program we flew the airplane at very

high speeds and established a Mach number and an airspeed plateau in the airplane. These test speeds were not needed due to an inability of building problems, but because I felt that we had exceeded the level flight capabilities of the airplane to the extent that those speeds would never be approached by an operator.

We had an difficulty coming out this investigation. We started the test at very high altitude, around 41,000 ft., with full power. We first flew at very high level-flight speed and then dove at a 15-deg angle, terminating the test at 15,000 ft.

All high-speed airplanes when approaching their high Mach number limit show some change of trim. This airplane is no different. It does have a

slight longitudinal trim change at the maximum speed we have reached. This is not undesirable, but it is a good and bad thing as far as it is only trimmed out, and you can hold it manually if you want to work hard.

I don't think of this trim change as a problem. In fact, it is being decreased right now through a slight modification.

At the maximum speed, the airplane can be flown hands-off. I have maneuvered the airplane at top speed with the high-speed altimeter and spoileron warning, and there is more than sufficient ease of roll.

I have conducted some of these dives with the spoileron inoperative and have made turns using full lateral control deflection at maximum Mach numbers. If the pilot should fly some more

FLY WEATHER-WISE



These weather items prepared in consultation with the United States Weather Bureau

Bolt down from heavy bomber shafts which fall from colder altitudes may cool cylinder heads enough to cause engine to seize. Avoid heavier showers whenever possible



Like showers, rain falling from scattered cloud layers may be warmer than the air through which it falls. Be prepared for poor visibility in the cold air near the ground, as fog is likely



To avoid turbulence along route, plot your way through the weather zones of an active low. Although instrument conditions aid in the vision may be compromised, the severe weather will be avoided.



Even though conditions appear good weather—conditions to beware are continuously passing. You may be unable to maintain visual contact. Check all available information on an en route weather as well as your forecast weather.

Best Pair to Get You There

STEREING CLEAR of stormy weather can add miles to your flight. Weather-wise pilots depend themselves with an extra margin of safety—keep tanks filled with Mobilgas Aero—the proven engine performance with Mobiloil Aero. These famous products are the result of 30 years of research and experience—famous with aviators since the Wright Brother's first flight. Why settle less for your plane?



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FLIGHT ENGINEER'S PANEL, in the 707 is large and can be rotated to either right or left as required. Position of eye reflects it into a panel where pilot can see it without leaving his seat. In some testing it is possible to get a malfunction quickly.

here has attention diverted and the airplane went to level flight and got into a 15-degree climb, then would be several indications that would warn him before the speed reached the planned limit.

First of all, there is the attitude—by the time an airplane is 15 degrees down, the attitude is such that the pilot is hardly looking at it. The air plane cockpit is normally quite free of noise and vibration, but, as speed and Mach number increase, there is an audible increase in noise that is a good warning.

Also just prior to reaching maximum speed, there is a slight lateral control "shock" which shakes the wheel very slightly, maybe 1/16 of an inch, at a comparatively low frequency, probably four or five cycles per second.

At maximum speed, there is a very slight buffet in the airplane which is brought about by the mutual separation of the motion over the wing.

To take up the capabilities of the 707 at high speed. This airplane is solid and safe—we have no fatigue problems and no stability problems.

Discounts on 12,000 Fpm.

High speed behavior characteristics are very good. Using lateral control gotten first on the brakes, we can make discounts up to 12,000 to 13,000 feet per minute from altitude to the deck.

Landing speeds are very good. The airplane was designed to operate out of existing fields and we have proved that it can do so.

The landing attitude is viewed by

these gear airplanes. Approach attitude is very high, in the region of 15 degrees and has to be rotated much on the floor mat. As soon as you touch down, you can rotate the airplane over onto the nose wheel thereby spilling the wings, reducing the lift and getting weight on the wheels.

With the spooler fully extended, which increases drag while descending lift, more load is placed on the wheels and allows very hard and effective braking immediately after touchdown.

Thrust-Reverse Tests

In addition there will be thrust-reversing. We have already tested the initial configuration. We wanted to find out if we could reverse the jet gas forward without overloading the nacelle or wing structure. Also, we wanted to be sure the reversed thrust would not blow debris forward where it could be taken in the air intake.

On the first test I accelerated the airplane up to 50 knots and reversed at 100% power. We didn't go faster because of the structural safety consideration we had a thrust reverser on one engine only. Number two.

The thrust reverser tests proved satisfactory.

There are some of the things we have learned in one year of doing the Boeing 707 prototype. They are things we could have had more expert opinion on, but there was couldn't have been certain of without flying the airplane.

Solid State Physics May Spark Revolution

Los Angeles—Within the next decade, a revolution in materials will result from research in solid state physics, Dr. G. G. Smith, General Electric Co. vice-president and director of research, predicts.

Pointing out that this research has been accelerated within the past five years, he said that it would lead to a host of new substances with physical properties conferring a high tensile strength, some temperature resistance, optimum resistance and magnetic permeability. Results of the research should include development of semiconductor devices such as transistors and diodes.

An important clue to the future in structural metals are the "perfect crystals" developed recently by G.E. metallographers, Smith and in this perfect crystal form, such metals like steel are stronger than our strongest alloys, he added.

New knowledge sheet detailed atomic structure of solids in giving a strong foundation for great advances in ceramics and plastics as well as in metals, Smith declared.

25 years of experience in aviation built the new SENSENICH METAL PROPELLER CAA approved up to 165 HP



TWENTY-FIVE YEARS of design and manufacturing experience in building 100,000 propellers for light aircraft—this is the solid basis on which we've built our metal propeller for use in aircraft. The improved metal propeller, its thorough vibration survey and flight testing results in a metal propeller of maximum efficiency and dependability.

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1001—General Motors Aircraft Division, Propeller Section, 1001

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SCINTILSCOPE reveals sound-wave pattern set up in sound tunnel.



SOUNDWAVE ENGINE G-3 sound generator. Helium ions conduct sound from shock-wave source in plasma chamber (upper in background) to sound tunnel (foreground).



TRAVELING MICROPHONE can hold by hand or by remote control. It picks up sound by moving along track inside the tunnel.



UNDERGROUND TANK at Soundwave facility drains deionized water from plasma which conducts traveling waves in sound tunnel.

Control of High-Energy Sound Seen As Path to Engine Improvement

By Irving Suss

Bethesda, Md.—Control research on the control of high-energy sound in aircraft jet, rocket and piston power plants may pay off in big performance and design dividends.

Already it has eliminated a combustion instability which was causing instantaneous destruction of a missile rocket motor.

Financing is this complex new field is Soundwave Engine Co., where president, A. G. Rodine, holds more than 100 patents or pending patents having to do with high-energy acoustics. He leads a relatively small staff of about 30 scientists, engineers, acoustics specialists and shop personnel.

According to Rodine, some of the techniques to require refinement are of an acoustic nature, with internal sound effects entering more and more into the performance picture. And as engine power levels are pushed up, the higher combustion chamber pressures aggravate the already perplexing combustion acoustic problems.

Sound has been assumed by many to be an effect of detonation or combustion instability. However, the president of Soundwave admits reluctantly that it is a crime.

The sound waves, generated at low amplitude by various moderate disturbances in the combustion process, echo from the combustion chamber walls into the combustion area. This causes the

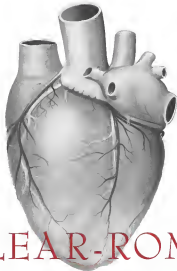
combustion area to be probed at burning rate, so the combustion, in turn, becomes the source of the sound. This repetitive process is a self-exacerbating and cumulative to high-energy sound levels—may wreck the engine, or seriously affect performance in the immediate vicinity.

Ultra-High-Energy Sound

Soundwave's basic research and development is concerned with ultrahigh-energy sound at any frequency. (This differs from ultrasound, which means a high-frequency sound.)

Little is known today about high-energy sound, Rodine says, but he believes resolution of high-energy sound problems associated with combustion should bring lighter, more efficient engines.

Engines could be lighter, Rodine says, because it would be possible to minimize structure now required to withstand the stresses imposed by gas



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extended over five years, but because of the complexity of the co-sounder mathematics involved, may only be about three-quarters finished now according to Boland. Presentation of results will be theoretical but will be based on extensive experimental data.

Sound Tunnel

Here's how Soundwave does its experimental data on this project:

A specially developed facility located in Pico Canyon, about 10 miles from Los Angeles, embodies what is probably the world's most powerful installed sound source. Sound waves are delivered from a 1,000-hp input source

to produce sound at one end of a long sound tunnel.

A special high energy microphone (such as a triaxial inside the tunnel, and the signal from this wire is recorded by electronic equipment). In this manner, the life cycle of the sound wave can be studied by observing change in wave shape as it goes through the transition from source to destination.

Many types of wave suppression are being applied to the tunnel to note the effect on wave shape. This suppressor effect adversely reveals the "distortion" of the sound wave.

Boland feels it may take two more years of this type of experimentation

to produce enough data for a comprehensive treatise on effects of high level city sound in combination chambers to guide the engine designer in developing optimum forms of sound suppression.

Other direct benefits may include devices for collection of sound waves emanating from facilities such as engine test stands, wind tunnels, airports. Boland says this is one of the many reasons for further interest in the high-energy sound study.

Included in the overall study is the effect of high energy sound on man and animals. This phase of the research, tied up with Air Force sponsored studies, is still continuing at the Pico Canyon site, Boland says.

Jet Engine Improvement

A sound suppression program is taking a turboprop engine combustion chamber was recently conducted by Soundwave for one of the engine manufacturers to determine the feasibility of modifying the external sound wave pattern, permitting construction of a lighter engine with better efficiency.

The complete jet engine was delivered to Soundwave and was connected internally with an electroacoustic source to simulate internal sound existing under operational conditions.

Many of wave suppression were designed and incorporated in the engine. Resulting simplification of the sound wave pattern eliminated unwanted acoustics in certain regions and suppressed desired acoustics in other regions (Boland says that under certain conditions sound waves can be beneficial to combustion).

Investigation is still continuing, now under the sponsorship of the military which needs a reduction of noise from the turboprop. A substantial part of this noise is generated externally, it is believed, although no definite amount can now be attributed to internal sources in comparison with that caused by the mixing of the mixture of the jet and the surrounding air, Boland says.

Surge Elimination

In another project on compressors, surge has been found to be an acoustic process. The surge can be eliminated, Boland says, by eliminating the resonance on the discharge side of the compressor. This is accomplished by installing low-frequency sound wave attenuators.

First phase of the work, to prove this theory was done on an actual compressor for a major engine manufacturer. Next phase is to install the low frequency attenuator on an operating engine. This will be an experimental job requiring a considerable amount of measuring adjustment in the situation to get best results.

A surge limiter has been developed

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NEWS Eds NOTES

AMPHIBIOUS FLOATS PROVE STAMINA IN USE



Operating on rough gravel strips in the far north of Canada, a Cessna-Ede 180 amphibian has proven the rugged capabilities of the new Ede amphibious floats. Used in connection with the DEW-Line project, the Ede goes without giving daily use with no difficulty whatsoever.

Since its introduction last spring the 180 amphibian, with a cruising speed of over 135 mph, has proven its exceptional performance under a wide variety of conditions. A 180 amphibian has even flown from a Colorado lake 8,100 feet above sea level.

Indivisible loadings with wheels resorted here have been made on at least five different occasions on both hard and soft runways with inconsequential results. Damage, if any at all, was confined to some wear on the fuel tank, after which the plane was in the air within 15 minutes. Load and water loadings were subsequently made without hitch.

To meet demand, production of amphibious floats has reached one per day in addition to production of standard Ede floats for Cessna, Piper and other airports. For more information send for new Ede literature.



beyond the sonic wall...

thermal barriers with, as yet, unanswered challenges!

• With each "boom" of a jet cutting through the sonic barrier, aircraft engineers give the sleeping dragons yet another twist. Out there in space—which mankind has dedicated itself to conquer, lies the ugly, wallowing form of the next big challenge—**temperature!**

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and built at Soudan to replace the converted gas turbine combustion chamber.

The new burner would not fuel consumption by converting some of the high-temperature thermal energy (which the turbine cannot fully utilize) into velocity energy which the turbine wheel can use directly in conversion to shaft horsepower.

Stage of the new burner is such that burning gas mixture automatically and go through a high-frequency pressure cycle which results in segmented firing of the gas toward the turbine buckets.

Detonation Control

Soudan also is conducting a detonation control project for two oil companies. The project is concerned with control of sound waves in piston engine combustion chambers. The equipment used in this research is a CTR (Combustion Test Facility) engine, a Pratt & Whitney R4360 engine assembly and a Wright R3350 cylinder assembly.

These units are fitted with acoustic transducers and checked out on a bench with an electronically actuated valve which generates a sound wave in the combustion chamber, whereby it is possible to simulate detonation.

The efficacy of the transducer is checked to see how they support the sound. Results indicate that, in ships using the sound reflection in the combustion chamber, detonation can be eliminated.

It is believed that one form of attenuation to eliminate detonation might be a simple hole, at correct distance, in the piston crown.

This research is continuing at Soudan.

Preliminary engineering discussions are under way between Soudan and a British engine manufacturer with respect to gas turbine engines. The British manufacturer is planning to incorporate acoustic studies in its engine design program, possibly based on Soudan data.

Various sound-absorbing materials such as porous metals, high-temperature fused silica fibers, mullite wool and water spray with varying droplet size have been studied in Soudan's sound tunnel, and some porous metals, dense steel wool and silica fibers have been applied to actual engine combustion chambers.

Bodner's background in acoustics is extensive. He is the author of the ultrasonic dental drill, now among the clinical stage of use, he was, as well as an acoustic ultrasonic drill being developed by Borg Warner. A series of wall group developed by him now is undergoing tests by various oil companies.

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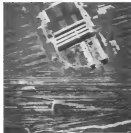
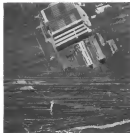
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EQUIPMENT



BOTH PHOTOGRAPHS shown above were taken at the same altitude and depicted camera using identical shutter speeds. The difference: Left photo was taken by camera equipped with instantaneous suspension system.

New Cameras Keep Pace With Supersonic

By George L. Christien

Chicago—Today's electronically-assisted photoreconnaissance pilot can accomplish tasks that formerly would have required the assistance of 10 qualified aerial photographers. He can do most of this by simply throwing two cockpit switches.

The specialized camera system, hidden away within the plane's fuselage and nose, includes equipment that compensates for major motion by using its

supersonic reconnaissance, integral gyroscopes, high-altitude cameras and Precision Automatic Photogrammetric Interferometers.

One of the largest producers of this equipment is the Chicago-based electronics, headed by Ted Sonae, a pioneer in the field.

One Out of 10

Today, 30% of all military combat aircraft being built are reconnaissance versions of fighter types, according to

the USAF, and photo reconnaissance has become important enough for the Air Force to call for a high-speed aircraft built especially for such work. These aircraft manufacturers, including Bell, are competing for the contract.

Among new military jets already being produced in photoreconnaissance versions are the RF-101, RF-4, F-105, F-4D and F-4E. Others are coming up. Future concepts being with CAI equipment include the RF-47, RF-5A, RF-64F, F-703P and F-703S.

New Developments

CAI refinements of aerial photographic control systems, components and cameras now make it possible to say large land areas and to produce sharp pictures from planes flying at speeds and altitudes which would have meant blurred photographs a short time ago.

The NCCS-1 (Navy Camera Control System) incorporates many of these refinements.

Samuel Barsky, CAI's assistant to the president, says the NCCS-1 system "provides increased reliability, greater simplicity and better accuracy with extended range and duration." Plans are in progress to install this system on new aircraft being made by McDonnell, Grumman, Douglas and North American, he said.

Automatic functions performed by



SONAE CONTINUOUS STRIP CAMERA photo was taken from a plane flying 100 mph at 250 ft. altitude. Top of powerline tower is blurred because movement of film was synchronized with ground movement.

Demands

the camera control system include:

- **Scanning.** This system senses the plane's speed altitude ratio.

- **Image motion compensation.** The film for still pictures is moved in its plane at a speed synchronized with the plane's speed altitude ratio to prevent blurring during high-speed, low-level reconnaissance runs. IVG studies used the movement now adopted from the Sonae-developed continuous strip camera.

- **Gyroscopic use of sequential cameras** is adopted so successive pictures are automatically taken with correct orientation.

- **Exposure control** automatically sets diaphragm opening and selects the fastest shutter speed for existing light conditions. The pilot can over-ride the control, deliberately over- or under-expose pictures by one or two f-stops (depth) to compensate for unusually dark or light subjects. A small indicator on the plane's instrument panel permits the pilot to select the exact exposure he desires.

- **Release of photo flash** occurs for night photographs is automatically sequenced and synchronized with camera shutter. The system also re-loads cameras after each exposure.

- **Compensation for drifting** a camera from vertical to oblique position (or vice versa) is done automatically.

- **Automatic correction** for plane drift is

SONAE STRIP CAMERA being loaded into F-4D Navy fighter. Note cameras in cockpit.



HIGH-SPEED, low-altitude strip photo showing distortion from the nose is corrected due to light disturbance. Open rollback largely eliminates this.

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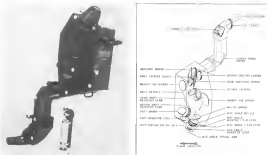
PEACE OF MIND IN THE COCKPIT... When the controls are set, the system is fully automatic and thoroughly reliable — especially so because of the simplicity of the Kollsman design.

NO WORRY IN THE MAINTENANCE SHOP... The components are simple and rugged, proven dependable and require a minimum of maintenance. There are no sensor controls or filters to clean, no complex tubing to worry about.

WARR for special Editor giving full technical details on the new Kollsman KS-54 System, or ask to have a sales engineer visit you.

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TYPICAL VIEWING RANGE maintained by Chicago Aerial Industries at left; Showing at right shows workholder's optical system.

automatically determined and controlled for.

Automatic Scanner

The automatic scanner is an auto-tuned adjunct of the workholder step and the image motion compensation still camera. This device synchronizes film speed movement with the speed of the aircraft, while taking into consideration its altitude above the terrain being photographed.

Until recently, 17,000 to 15,000 ft. has been the maximum altitude at which the scanner would work. But a new ground-based model now going into production will push the maximum operating altitude up to the 60,000 ft. range. Once existing base greatly reduces the scanner's sensitivity to angle velocity — 501 radians/sec. at 50,000 ft.

The subject-matter camera is a Zeiss-Ikon containing two lenses which scan the ground over which the plane is flying. The lower lens (image of the ground) on two small grids consisting of alternate transparent and opaque bars 410 in. wide on the surface of a glass plate. As ground images move across the grids, photoelectric cells behind the grids receive alternate light and dark impressions from constant variations in the image caused by the changing patterns of the earth's surface passing under the plane.

Use of two lenses and grids enables the system to correct out sudden changes in ambient light level. For example, if the plane is flying over a

large dark area such as a forest and suddenly crosses a light concrete highway, the brightness of the concrete's reflection produces a large change in light level which interferes with the device's output signal. But the two grids are placed so that the sections of image falling on the clear areas of one fall on the opaque areas of the other. Therefore, as light transmitted through one grid increases, light transmitted through the other decreases, resulting in a canceling effect.

Frequency Converter

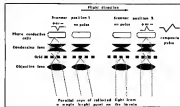
Constant variations of the earth's surface, focused on the photoelectric cells, produce electrical frequencies—the

higher the image moves across the two grids, the higher the frequency signal. Thus, frequency generated is proportional to the rate of aircraft ground speed to aircraft altitude.

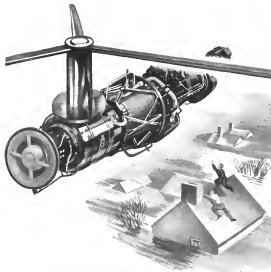
Frequency signals are fed into a special converter which does three things:

- Evaluates the signals and rejects all extraneous ones, selecting only the frequency proportional to the aircraft's speed/altitude ratio.
- Converts the frequency into a d.c. voltage proportional to this ratio. Voltage is supplied to the camera control system which governs all camera drive.

- Thus a "baseline" signal is set, the last signal received and keeps feeding a fixed voltage to operate the camera.



HOW TWIN-LINE SCANNER blocks bright light at left, around glass does not reject light. First grid does the same with direct light (right).



The heart of a good helicopter

A helicopter engine that works without driving shafts and driving gear—that's the Napier Oryx. It's a 750 gas h.p. turbo-gas-generator, designed for helicopters propelled by jet reaction at the rotor blade tips. It weighs 1660, it's free complex and it's easier to maintain than conventional helicopter power systems. The Oryx is a step forward—and upward—in helicopter propulsion, and an engine of great importance to helicopter operators.

NAPIER Oryx turbo gas generator

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test system in case of signal loss which might occur if the plane flies over no contact areas such as mountain stretches of road or dead radio waves. The camera cannot build the voltage constant for at least five months at a time; the camera again picks up reliable light signals.

Image Motion Compensation

A 500 rpm, plane turn 67 ft. diameter, 180° advanced exposure, making panorama necessary against blurring.

CAL technicians, having already solved the problems of synchronizing film and sprocket speeds for the gas cameras drop camera, adapted the same

logic principles to the cameras of their suspended still camera.

INIC receives its signals from the camera and causes the film holding plates in the magazine to synchronize with the plane's speed/altitude and during film exposure. The result is a picture as sharply defined as though the camera were motionless.

Recent improvements in both Air Force and Navy magazines include substituting an electronic drive for the previously used mechanical drive and newly developed features for automatically controlling the operation of airborne photographic equipment.

Essential to the success of a photo reconnaissance mission being flown by



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cut, they go into the desired cut legs, posing a problem of fitting them into jet engine places where the entire nose may be used to house the engine intake or duct. In at least one installation, CMI engineers had to devise a method of "hooking through" the duct.

Light is transmitted through the window by means of a complex optical system of lenses, prisms and mirrors. Many optical problems in making windows is the elimination of distortion and parallax.

Bonks summed up these other tough mechanical points:

- Providing structural rigidity and precise optical alignment into viewfinders, yet keeping them light to a minimum
- Stopping moving optical components in exactly the same position each time they are shifted
- Supporting lenses, mirrors and prisms rigidly to withstand vibration and shock. Many aircraft impose penalties severe problems because of high impact and shock resulting from catapult takeoffs and missed landings

Night Photography

To run a night photography mission, a pilot sets altitude and speed values into the camera control system and flies the "aperture" switch. An internal controller compares the data, internal camera between sensor beams as they and provides the pulses to release shutters at the correct rate.

The camera shutter is opened and waits. An electronic flash detector "sees" when the flash occurs and closes the shutter. The magazine retracts the film and the shutter reopens, waiting for the next flash.

Timing is such that the photoflash explodes outside of the angle view of the lens in several degrees to avoid light striking the film.

Colors are recorded automatically without any further attention from the pilot.

When the mission is completed, the pilot turns off the switch. The camera alone stops instantly, but the remainder of the control system is kept in operation by an automatic control. This means that pictures will continue to be made until an overexposed film starts roll in the air when the switch is turned off. Photoflash used in night photography are either cartridges (called as bombs). The longest are relatively small (1 1/2 in. diameter and 5 in. length) produce about 100 million candlepower and are less than 1 lb. They develop a peak flash intensity of about 1 billion candlepower and will work at altitudes ranging from 5,000 to 25,000 ft.

CMI operations in the field of aerial



Two Aerojet-General Nightstare, short-duration solid propellant rocket powerplants boost the Navy's latest REGULUS missile off its sleds.

Built by Chance-Vought, the REGULUS is one of a growing number of available missiles for defensive or offensive applications.

This booster was tailor-made for REGULUS. Proven reliability, productivity and low cost make it another example of Aerojet-General's unparalleled experience in development and production of rocket powerplants.

Aerojet-General supplies liquid and solid propellant rocket powerplants, auxiliary power units, gas generators, or other associated equipment as a major part of America's missile program.

Since the first JATO was produced by Aerojet-General in 1942, the company has delivered over 350,000 JATOs and boosters operating in thrust from 250 pounds to 100,000 pounds.

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MORE POWER FOR AIR POWER

Turbopump Requires No Controls

By Irving Stone

Enhance—A pneumatic-driven fuel transfer pump powered by bleed air and requiring no controls has been developed for jet aircraft service by Hyd-Air, Inc.

First application of the turbopump is on a new Douglas plane as a tank-mounted subpackage unit. Another version is being built for evaluation testing on the F4H by North American Aviation's Columbus division.

Weight of the new turbopump pack-

age is 10 lb. Capacity is 35,000 lb. per hour (51.6 gpm) at 9 psi, utilizing turbopump engine bleed air at 5 lb per square inch.

The package is now out of the development stage and is in production.

Continuous Operation

Outstanding feature of the unit is that it operates over the complete range of engine bleed air conditions and fuel flow requirements and also in a dry tank, with no controls. There are no pressure or speed-sensing devices, shut-

off valves or actuators.

So long as the engine is operating, the pump will continue to operate without attention.

With the tank dry and the pump load removed, the turbine runner speed does not exceed the mechanical horsepower of the unit.

Normal operating speed is 12,000 rpm under load, and 25,000 rpm with a dry tank.

The turbopump has completed 288 dry-run qualification tests in cycles ranging from 50 minutes at 5100 bleed air temperature down to shorter time intervals at higher air temperatures.

The unit has been tested, while purging, for 1,200 simulated flights at altitudes above 50,000 ft. It is designed to respond, after being uncovered, and run dry, with only 4-in inlet submergence, at all operating speeds.

Minimum temperature of the turbopump is safely below the autoignition temperature of the fuel under all operating conditions.

The maximum case temperature reached during qualification tests of the turbopump was 185°F.

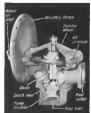
Turbopump Features

Hyd-Air points out that the bleed air drive offers the following advantages, in addition to the no-control feature:

- Greater reliability. The pump is not subject to electrical failure, since power source is directly from jet engine bleed air.

- Weight savings. There will be a weight saving on the plane if the bleed air during required for the turbopump weighs less than a separate power source and controlling equipment used for the electrical drive counterpart.

In normal installations, a Hyd-Air spokesman points out, the turbopump can be located close to the source of



BLEED-AIR fuel transfer pump removes stored turbine, auxiliary and ducting debris.

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CEERS... To eliminate the "when layer" problem, CECO gears are made of Flaming Steel, hardened, and the teeth ground (not shaved)... the result is maximum durability and accuracy.

BEARINGES... are fully supported and placed with "chockblades"... an exclusive CECO material and process that assures longer life, maximum maintenance.

ALIGNMENT CONSTRUCTION SETTING... Components are centered in a common bore, easier to disassemble and reassemble for routine maintenance; no complicated re-alignment is required.

If a lower in performance run help your present project need for extra boosted performance above CECO Pumps... and above completely surpassed CECO Fuel Pumping and Control Systems. Ask for your copy of "Customer's Key To The High And The Mighty..."



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DRONE 'COPTER

Typical of the advanced controls and development projects currently being carried out successfully by Kaman Aircraft is this drone helicopter. The numerous problems of remote control are more complex with a helicopter than with fixed-wing aircraft because of the 'copter's ability to fly in every direction at varying speeds, as well as to hover in flight. Kaman engineers solved these complicated problems by designing its entirely new electronic control system, miniature mechanical system and small automatic pilot. Kaman is proud that more of its 10 years have been devoted to the National Defense effort to keep the live world live.

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the blood as to minimize length and weight of ducting.

• Absorbs shortage of electrical power. Since the turbine operates on blood or, no additional ducts is placed on what ducts might be in acute electrical load.

• Variable speed enables turbopump to match the operational needs of the plane more closely than does a constant speed electrically operated pump. The turbopump's speed and output decrease with the reserve in altitude, keeping pace with the jet engine's low-speed fuel demand, Hydro-Mac says.

Internal Details

The turbine consists of a single shaft driven also, five-diameter disk (in the Douglas application) with integral blades. The simple blading permits manufacture by machining, casting or forging.

Acromechanic characteristics of the turbine section are such that recovery speeds cannot exceed 25,000 rpm, with the specified blood in conditions.

The pump capacitor is of the same type used in the company's electrically operated transfer pumps.

Impeller and turbine wheel are integrally mounted on a hollow shaft supported on grooved-labored ball bearings inside the shaft.

Feed side of the turbopump is separated from the air section by means of a carbon-face type shaft seal. In the event of feed leakage past this seal, the seal is drained off at a low point before it can reach the bearings and cause lubrication failure.

Turbine exhaust is piped immediately outward beneath the wing.

The package is designed to operate 1,700 hr. without maintenance, Hydro-Mac says.

Gulf Develops New Piston Engine Oil

A new thrust engine oil for business and private aircraft manufacturers is being marketed by Gulf Oil Corp. It is designed for use with both radial and horizontally opposed engines.

The new lubricant replaces Gulf's Series R aircraft engine oil. It comes in SAE grades 50, 40, 30 and 20 and is packaged in quart and gallon. It is a high-quality, straight mineral oil, developed from a new blend of crude oil stocks and refined processes, Gulf says.

The company claims the new oil improves engine cleanliness, reducing carbon loss coating and deposits on oil inlet screens.

The oil has been approved by Civil Aeronautics Administration, based on service approvals by Pratt & Whitney Aircraft and Wright Aeronautical Division.

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B-52 Ancillaries Use Pneumatics

Boeing's B-52 Stratofortress is America's first aircraft to have all its pneumatic accessory systems driven by air.

The pneumatic power, bled from the second stage, high-pressure compressor of each of the plane's eight J57 turbojet engines, provides drive energy for the air and electrical systems, hydraulic and air conditioning systems and the water injection pumps. The air is supplied to power packs located throughout the ship, where it is converted to other forms of energy.

Boeing studies showed that a low-pressure pneumatic system for powering the accessories would be lighter than high-pressure pneumatics, but directed as an electrical system.

The first layout consists of a dual system in which air from the four upward and four outward engines is piped through separate ducts. Thin stainless steel ducts manifold air from each pair of potted powerplants and pipe it up the strut supporting each main fuselage engine in a duct along the leading edge of the wing to the fuselage, outboard engine along the trailing edge.

Leading and trailing edge manifolds are interconnected by ducts which include normally closed shutoff valves. Purpose of the connecting ducts, pneumatic is to allow one engine to feed the other in case of power loss or rupture.

Design criteria for the system were based on bleed air temperatures up to 750° F and pressure to 205 psi.

In production, B-52s believe are used to absorb thermal expansion, duct misalignment and structural deflection as the wings, struts and nacelles. In the fuselage, these factors are taken care of by expansion loops, expansion joints and the inherent flexibility of the duct configuration.

Duct diameters range from 2.5 in. to 3 in., with wall gages from .016 to .017 in. **Pyralis** is insulated with a 0.5-in. layer of **Pyralis** and covered with **Neoprene** or **polyurethane**. **Pyralis** ducts, in initial tests on the XB-52, expanded below in the wing trailing edge became unstable and failed by rupturing after exposure to air at 200 psi for 10 minutes.

Steps taken to correct this included redesign of stability brackets supporting the ducts and their relation within 2 in. of the expansion bellows flanges. Also, the ducting material (ASTI 121) was now hardened to a strength approximately equivalent to one-gallon hard.

Another problem was bellows making, originally thought to result from improper fabricating techniques. These

were changed, but cracks still appeared. Tests showed that the bellows were caused by the high weight flow of air but high velocity on which produced destructive vibration, the quakes.

Solution was to insert a variable layer in the bellows to smooth the flow and reduce the vibration.

Two types of duct joints are used in the production B-52: pneumatic nut-tight 40-deg. V-band coupling and a belted flange.

The V-band coupling, which can be

taken apart quickly, incorporates solid steel flanges with aluminum-clad bellows gaskets. It is used in only a few locations where the quick-disconnect feature is required or lack of clearance makes it impossible to use the belted flange.

The belted flange joint is first compressed in a clamshell-covered aluminum bellows gasket, similar to the one in the V-band coupling. But a testing program suggested improvements for the production aircraft, including a new gasket material for a better seal, increased flange thickness and radius of fillet between flange and base for added rigidity.

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Least-cost quick-set base compounds, catalog T-100, 10 Hunter St., Springfield 4, Mass.

Monitors also line torque gauges, selection made, bulletin, Electric Tool Corp., 5 Macdonald, N. J. Light water and oil insulated nuclear test section, Bulletin GER-1125, four nuclear research section and their uses, Bulletin CEN-6126A, General Electric, General Sales Div., Schenectady 5, N. Y.

Technical data and circuit design points for Thin-Conn printed wiring boards, brochure, Electronic Components Dist., General Electric Co., W. Concord St., Andover, N. Y.

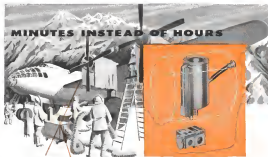
Key-Lite hydraulic cargo lift, bulletin, Kevorse Engineering Co., 1441 S. San Pedro St., Los Angeles 15, Calif.

Improved method for blanking machine beds from the solid, Bulletin 51154, In-Cut-30 Corp., 1390 Oldman Blvd., Detroit 32, Mich. Heavy duty stainless steel track of 4,000-lb. capacity, bulletin 331, Rayward Corp., 182 137 Madison St., Greenc, N. Y.

DBL-242Z Fine Machining High Speed Steel, Blue Data Sheet, Allegheny Ludlum Steel Corp., 2025 Oliver Rd., Pittsburgh 23, Pa. Twelve step clamp assemblies, folder, Jorgens Tool Services Co., 712 E. 163 St., Cleveland, Ohio. Hydraulic Valve for Aircraft, Industrial and Marine applications, Bulletin 151, Electric Tool, Kingston, N. Y.

Design and Selection of Thermal couples, Bulletin 2508, Liquid Temperature Thermocouples, Bulletin 1605, Gas Temperature Thermocouples, Bulletin 1507, Surface Temperature Thermocouples, Bulletin 1604, Revere Corporation of America, Woburn, Mass.

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assemblies for hydraulic action return and general applications. Catalog 180, Aviation Catalog Co., Inc., 342 N. Fourth St., Lincolnville, Ill. . . . Micro-Haight Cages for accurate bore and taper work. Bulletin 10510, Great Manufacturing Co., New Haven 13, Conn. . . . Precision optics, bulletins, Zurich Optical Laboratory, Copeland 1, N. Y.

VU and DR self-contained precision panel instruments. Bulletin VU131, Electronic Sales Div., DeJure-Arco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y. . . . Acoustic time delay relay models. Bulletin SD-1, AGA Div., Elastic Stop Nut Corp. of America, Elizabeth, N. J. . . . Servo 108 motor, totally vacuum free-cooled and open drip-proof types. Bulletin N-100 K, Howell Electric Motor Co., Howell, Mich.

Automation engineering bulletins: doublets positioning control system. CUC Control Systems, Inc., 400 S. Wacker Drive, Harbor, Ill. . . . Scraphely based standard plastic, electronic manual. Dept. SP5291, Minnesota Mining & Mfg. Co., St. Paul 18, Minn. . . . Alphabetic Telephone for translating punch-coded data into printed form. Folder TM491, Rostington Farm Div., Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y.

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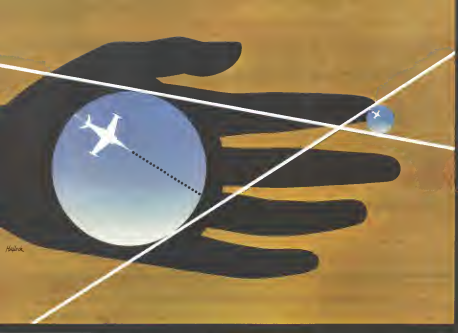
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Lack of Channels May Block Use of Tacan as Common System

By Philip J. Klass

Washington—Scarcity of Tacan's ability to provide sufficient channels to meet Common System needs during the 1965 period was noted by the Air Transport Association in a recent operational memo to its members.

It was the ATA which cast the deciding vote in favor of Tacan rather than jet during the holding of the seven-day Vortic symposium.

Scarcity also limits about Tacan's ability to meet Common System needs in other selected carriers, as during the Air Navigation Development Board, American Vortic learned.

ATA's memo estimates that at least 827 channels are needed but that only 90 of Tacan's potential 128 channels can be used because of a conflict with military and civil radio transponders which operate in the same band.

Unless civil DME is scrapped, ATA believes there will be only 66 Tacan channels available.

If ATA is correct, the present VOR DME system also lacks sufficient channels for the future. Civil DME has 108 channels, while there are 80 channels of VOR and localizer.

The obvious dilemma between the two situations is that VOR/DME is in existence, whereas Tacan is being considered for future needs.

'Fluid and Confused'

The current dilemma makes only too plain the need for the project of their operation by late 1970 and also about DME's status, notes ATA is able to see a clouded victory in the near future.

However, despite nearly two year's efforts to resolve the Common System status of Tacan and DME, the situation at the moment can best be described as fluid and confused.

For example, a new experimental airborne Tacan set, reportedly capable of automatically transmitting actual bearing and distance back to the ground (where it is automatically recognized with bearing-distance obtained from ground radar) to provide positive aircraft identification) will undergo tests soon.

This feature, which has important uses for both military and civil operations, would give Tacan an operational feature not now available from

VOR/DME, and might strengthen its case for priority.

Several months ago, the Air Navigation Development Board's Advisory Committee No. 1, consisting of representatives of nine different military and civil agencies and aerospace firms, drew up a plan for future Common System requirements.

It calls for:

- Airways type coverage between major radio hubs, at altitudes of 700 to 15,000 feet
- Area (grid) type coverage at altitudes of 15,000 to 75,000 ft
- Area (grid) type coverage at altitudes of 15,000 to 75,000 ft. This would permit off-airport flight when aircraft are equipped with all-weather transponders.

Which Plan?

Some of the confusion stems from the fact that the ANDR committee relied on three alternate plans for its recommendations without clearly indicating whether these are acceptable of the first of the proposed plans can not be indicated.

A National Bureau of Standards determination of the number of Tacan channels required to implement each of the four different plans, originally scheduled for completion this year, has been delayed until early 1970. If the analysis indicates that Tacan lacks sufficient channels to meet the first

plan, the second plan will be adopted. If the analysis indicates that Tacan lacks sufficient channels to meet the first

ATA Sees No Solution

"The effort to parallel our status (either Tacan or DME) has failed to date. What the Government will do from now on is problematical, but it is a fact that there is no known engineering technique by which both existing Tacan and DME operations, fully implemented, can operate satisfactorily without limiting the operational value of either at both extremes," the Air Transport Association told its members in a recent memorandum. It added:

"In failing to make a clear-cut decision for Tacan, the Air Coordinating Committee probably has presented DME to continue to expand in a form that, in any event, can not be dropped, even by the 1960 'beyond-the-cloud' deadline now established."

plan, but is able to meet one or more of the others, observers expect another battle to ensue.

On the surface, the recent two-day Tacan symposium last, sponsored by the ANDR, might have led some to believe that adoption of Tacan as a Common System navigation aid was a foregone conclusion, although this was not ANDR's intention. The symposium was attended by 700 people, with interested observers from more than 20 foreign governments, including the Soviet Union.

(The USSR embassy representative, Eugene Miron Vladimir V. Kolesnikov, contented an attack, told American Vortic, that he was impressed with Tacan's capabilities, but added that he is neither an electronics engineer nor a navigation aid expert.)

During the detailed reports on the technical and operational characteristics of Tacan systems and ground equipment there was only an occasional reference to the latter controversy going on behind the scenes. A report by the Civil Aeronautics Administration on its evaluation of civil Tacan equipment showed bearing errors of as much as 24 to 5 degrees considerably higher than those reported by Navy, Air Force and Airborne Instruments Lab representatives, since the latter were on improved test models. These latter tests indicated bearing errors of less than one degree.

Behind the Scenes

Behind the apparent calm of the symposium, however, in little more than a few days in the corridors, the air was filled with rumors. One observer was inclined to remark that the symposium might prove to be "a wake for Tacan."

The question of whether Tacan offers sufficient channels is desperately simple.

On the surface, Tacan appears to have 128 channels. However, not all of these channels are available for use, because military and civil transponders (which become an interference of 1,010 and only on 1,500 MHz, right in the middle of the Tacan band).

Airborne Instruments Lab, under ANDR sponsorship, has made a study of how many Tacan channels will be intercepted by the transponder less used. The answer is "not a single number, but a range of values depending upon the beacon characteristics," ANDR's D. K. Morris told the symposium.

Informed observers say that, in any case, the bureau will knock down the



NOW IT'S 8,500,000 HOURS FOR THE G-E J47 IN THE AIR

As General Electric enters its 15th year in jet design and manufacture, J47 sets new world record for jet operational flight time

Just where the 8,500,000 hour mark was set this month, is not known. It could have been in the Boeing B-47's shoes on the left. Or in the twin North American F-86D shown below.

The significant fact is that the J47's new record represents a jet milestone. For now this single General Electric jet engine has more hours in the air than any other known jet engine in the world.

Despite J47 operating and durability records, General Electric's ultimate jet goal remains, "Faster . . . farther . . . higher." To translate this objective into hardware, G-E technicians are today concentrating on the development of still better, more reliable engines for future aircraft. For example:

• A greatly advanced G-8 jet engine is now being

tested. When it goes into production, it will make possible forward strides in the speed and performance of new fighters and bombers.

• Still more advanced G-E powerplants—including rocket and storable—are in early development phases. And General Electric is backing its development programs with a multi-million investment in new facilities, studies in advanced propulsion principles, and the development of new components and accessories.

Since initial delivery to the Air Force in 1946, J47's have flown more than 4½ billion miles—the equivalent of 90 trips to the sun. This mark may not be surpassed, except by the J47 itself, for some time to come. Today, more G-E jet engines power Air Force planes than all other jet engines combined.

104

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"ON COMMISSION" RATE of J47's powered aircraft is now of record high. In fact, over 18,000 J47's are in stock, ready to go in USAF fighters and bombers. North American F-86D, above, is powered by J47-GE-16.



HIGH RELIABILITY of G-E J47's is especially evident in engines now installed in Boeing B-47's. 1,800 hours of trouble-free operation on some models of B-47 engines has helped cut costs, increase Strategic Air Command combat assets.



IMPORTED MAINTENANCE of J47's in recent years has paid off in better B-47 jet performance for U. S. Air Force. Total effort of G-E techs and USAF training personnel is playing vital role.



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number of usable Tacas channels to around 100, roughly equal to the number of DME channels and slightly more than VOR.

ATA is more pessimistic, estimating that there will be only 80 Tacas channels available, or only 60 if co DME is operated.

Co-Channel interference

The ones of the question over the number of channels required arise from the problem of co-channel interference, i.e. interference between two stations operating at the same frequency within range of each other.

From limited tests which Federal Telecommunications Laboratory has run, it appears that two Tacas stations can be operated at the same frequency within line-of-sight range of each other, without the serious interference which would be encountered with continuous-wave (CW) systems such as VOR.

Whether co-channel Tacas stations can be spaced more closely than VOR stations will depend upon whether current tests confirm the preliminary Federal findings.

Countering this possible Tacas advantage, however, is the effect of "off-air" or "leak" in Tacas's vertical coverage. This condition, which results from ground reflected signals reaching the electropods again, is much more critical at 1,000 mc than at the lower VOR frequencies.

Altitude Controls Spacing

Another factor which determines co-channel station spacing is the minimum altitude at which reception signals must be usable and above which some interference or loss of signal may be tolerated.

For example, at the top limit on the low-altitude Tacas service network was 13,000 feet (as is ANDR's Phase No. VI, stations operating at the same frequency must be separated by approximately 470 miles. If this altitude were dropped to 10,000 feet (as



Midget Receiver

Midget radio receiver, yet based to either 15.85 or 41.55 mc, and working only 6 in. x 6 in. x 6 in. battery. It is suitable for pump service. Manufacturer: West Coast Electronics Co., 2073 West Jefferson Blvd., Los Angeles, Calif.

ANDR's Phase No. VI, co-channel stations could be located within approximately 330 miles of each other.

From the following tabulation of the data given proposed by ANDR's Delivery Committee No. 3, it can be seen that the particular plan adopted for Tacas coverage will have a major effect on the number of Tacas channels required.

Phase No. 3—Minimum Coverage—Solid Coverage

1. 100-1,000 ft. A.	10,000-15,000 ft. B.
2. 100-1,000 ft. C.	10,000-15,000 ft. D.
3. 100-1,000 ft. E.	10,000-15,000 ft. F.
4. 100-1,000 ft. G.	10,000-15,000 ft. H.

DME Head Start

Definite information, a useful addition to any output, takes on special importance in a pilot's, whose concerns but appetite does not want such low-altitude listening during an approach. CAA has set up procedures which permit a DME-equipped aircraft to make a fast straight-in approach and landing, instead of requiring the usual pattern approach.

While CAA would have to extend similar privileges to Tacas equipped aircraft if Tacas should become the Common System, the fact that civil DME has at least several years jump on Tacas from its implementation standpoint works to its advantage.

CAA now has 17 DME ground stations installed, of which 254 are now in operation. The service, on the other hand, has taken delivery on a total of 108 URN's Tacas ground stations, but only 50 of these are installed, and only a handful of this number are operating by May 15.

Although official figures are not available, it is safe to estimate that it will take a minimum of one to three years before the number of military Tacas stations in the U.S. equals the number of DME's. And even then, the military Tacas stations will not provide the complete and accurate coverage required.

CAA experts estimate that it will take three to four years more to develop the military Tacas ground station equipment to make it suitable for civil use. (An active industry for dual equipment, with automatic switch-over, plus conversion from single to three phase a.c. power.)

Unless CAA is able to speed up this cycle, it would certainly take another five years for industry to build the equipment and for CAA to install and commission it.

Active Position

The industry undoubtedly are reluctant to become entangled in the search of Tacas versus DME. However, efforts of two entities which

PIONEERING is our business



NEW-DESIGN **Bendix**

OXYGEN REGULATOR

MILITARY TYPES MD-1 AND MD-2

Accepted standard for both Bureau of Aeronautics and USAF • Meets all requirements of MIL-R-25100 • Models for high and low pressure, gaseous and liquid oxygen systems.

Just now going into production is the new high-altitude Bendix Type 2891 Automatic Demand Pressure Breathing Oxygen Regulator. It's another big achievement resulting from pioneering by Bendix—the world's most experienced manufacturer of oxygen regulators and converter systems. For full details on the new Type 2891, or on other oxygen equipment, write: PIONEER-CENTRAL DIVISION, BENDIX AUTOMOTIVE CORPORATION, DAYTON, OHIO 45424.

West Coast Office: 117 S. Normandie, Burbank, Calif.

East Coast Office: Bendix International Division, 300 S. 4th St., New York 14, N. Y.



Breaking the Sound Barrier

TEMCO helps build the supersonic F-100 Super Sabre

Recently, North American awarded TEMCO three important jobs on the Air Force F-100 Super Sabre.

The fighter was the first operational aircraft to break the sound barrier in level flight. Until F-100 components — wing tip gun, sensors, flaps, pylons — are being fabricated at TEMCO.

These jobs are typical of TEMCO's work on a growing number of first line military aircraft. And, on its 10th Anniversary, TEMCO pledges a continuing effort to preserve the peace by keeping America strong — the industry's Number One Job.

ENGINEERS

If you are interested in a position with a growing weapons system organization, write full particulars to E. J. Horton, Jr., Engineering Personnel, TEMCO Aircraft Corporation, P. O. Box 6191, Dallas 3, Texas.



smooth ordered pattern and almost universal language in describing their operational requirements. Some type of distance information is highly desirable."

A tailhook surface is connected to a landing wheel that goes down to 10,000 ft altitude, and a tailhook is connected to 10,000 feet, make a piston engine aircraft which can come down for a "back seat," and then proceed to an electronic if necessary, and make off and hold between 10,000. "The major electronic knowledge of distance to destination made more important," he said.

The other surface effect and line computer experts to build airborne weather radar in its job and first the equipment can provide a wide type of distance information to cover that Tacon or DMF is not satisfied.

Decision Needed Soon

When the next few months the surface will have to spend the money equipment which is to go into their new jetlines. Under a firm ANAF decision is reached before that time, each other will have to make its own appraisal of the possible results. The alternative is to have the electronic warfare units only generated using precision, capable of adaptation to other type of equipment or more later date.

One ATA fear is that some surface use has DMF, others Tacon, existing a serious decision within the ranks of the air command.

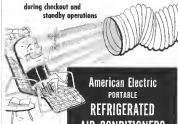
Accommodated Radio Inc., which does up component characteristics (spare) to provide overall interchangeability between airborne equipments made by



Small & Powerful

The semiconductor transistor tube for use in small portable radio sets is not only said to be the world's smallest but in 10 years came provided from the kitchen table it replaced. The new transistor, weighing only 8 oz., was developed at Army Signal Corps Engineering Laboratories, Ft. Monmouth, N. J.

COOL AIR for HOT electronics during checkout and standby operations



American Electric
PORTABLE
REFRIGERATED
AIR CONDITIONERS



an *Electroflow*
Product

Model AFM 1148
Illustrated

These compact portable units supply cooled air at an improved volume for maintaining temperature of electronic equipment aboard planes during ground checkout or standby conditions. Made in a wide range of capacities from 1/2 ton to 30 tons, 1" sq to 8-pig output pressure. Electric motor or gasoline engine drive. Trailer mounted or self-propelled.

Units are also on service on the Douglas B60 and Convair F105.

Write for questions on your specific refrigerating requirements.

Application
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Electric Machinery & Equipment Division of



3112 Chico Avenue, El Monte, Calif.

Light Company

New Hydro-Mechanical Fuel Control by Honeywell



What it looks like. One representative of the Honeywell series 40 hydro-mechanical gas turbine engine control is shown above. Capable of being packaged to fit any aircraft, it requires only about 120 cubic inches of space, weighs less than 15 pounds.

For any gas-turbine aircraft—fixed wing or helicopter

EFFICIENT, LIGHT, COMPACT, RELIABLE. These qualities, an experience "must" for any jet aircraft, are characteristics of the new Honeywell series 40 hydro-mechanical fuel control.

The new unit is designed to control fuel flow automatically on turbo-prop and turbo-jet engines. With it, engine control is automatic—but the pilot can take over in an emergency.

The series 40 is an electro-mechanical governing unit that's ideal for single-speed and two-speed turbines, fixed and duct-cooled turbo-prop and ducted fan engines. The fuel itself accomplishes all control functions. No external source of electrical, pneumatic or hydraulic power is needed.

Honeywell's years of experience in designing engine regulation controls are reflected in the design of the new control.

Flexibility as important feature • The series 40 can be sized for fuel flows up to 6,000 pounds per hour. Other series of Honeywell fuel controls utilizing the same principles can be designed for higher fuel flows. • Control components can be packaged to fit any specified envelope.

• Control fuel output can be overridden or eliminated by applying additional input signals (examples: temperature rise, temperature oversize, overspeed). • The basic control can produce signals such as serial engine speed, corrected engine speed and engine inlet air pressure for use in other engine control loops (examples: compressor bleed control, inlet guide vane control).

High lift • Small and compact in size (120 cubic inches or less possible without emergency features). • Incorporates fully duct design. The control can be mounted on a "sandwich" type fuel pump, thereby eliminating cumbersome plumbing. • Operation is any altitude from sea level to 65,000 feet and up to and including sea ratios of 1.8. • Accommodation of flow speeds within the range of 950-4,000 rpm. • The series 40 control is designed to meet the applicable portions of Specifications MIL-E-5099A and MIL-S-8807A. • Incorporates an emergency manual control (optional).

Honeywell jet engine controls are available to manufacturers who require precise performance. For details write our post business representative to Dept. AW-11-13, at the address given on the right.



What it's made. That is an aerial view of the main Aero Division plant in Minneapolis. The entire 17 acres of modern plant is devoted exclusively to the manufacture of air-borne controls. Over 5,000 people work on the varied operations. Hundreds of them work solely on jet engine controls, making Honeywell's leading specialists in the engine control business.



Laboratory tests on the series 40 fuel control were made in this engine control laboratory adjacent to the main Honeywell Aero plant. Computers alone played an important role in this phase of testing. Every Honeywell flight condition was set up on the machine to give the control rigid standards to meet. Only then was the new control ready to be flight tested.

Sharp flight tests are made on all Honeywell aeromechanical controls. Tests of operation in the Honeywell flight test at Wold-Chamberlain field in Minneapolis. A hangar of sharp undergoing tests is shown below in this photo of Honeywell's facilities in the Minneapolis field.



It suits its engineers. Direct duty, covering new problems that in our instrument and control work. It's not qualified men. If you're interested in engineering, write: *Division of Engineering, 2600 Railway Road, Minneapolis 13, Minnesota.*

MINNEAPOLIS
Honeywell

Aeronautical Division



2600 Railway Road, Minneapolis 13, Minnesota

**BIG LOAD • BIG LIFT
BIG PERFORMANCE
ARE BUILT INTO
FAIRCHILD C-123**

Maximum load-carrying capacity and workhorse durability are just two of the many reasons why the Fairchild C-123 Assault Transport is ideally suited to tough jobs in all combat airlift operations.

Equipped with Fairchild J44 turbojets on each wing-tip, the C-123 is provided with a power package of 2,000 lbs. extra thrust to meet any critical take-off or flight requirement.

In front line operations, on any terrain, under the most difficult conditions, the Fairchild C-123 goes big load, big lift, and big performance where and when utility and logistics support is needed.

A Division of Fairchild Engine and Airplane Corporation.

FAIRCHILD
AIRCRAFT DIVISION • HAGERSTOWN, MARYLAND
...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS



Looks as if it will fly for years to come in new length. The Fairchild C-123 remains in any terrain with only 300 lbs. of fuel weight.



Fairchild J44 turbojet engine provides power to the C-123, providing the extra thrust of extra 2,000 lbs. in any emergency condition.

NUMBER 4 OF A SERIES



Loading ramp is built in. Up to 25,000 pounds of bulk cargo can be flown right into the fuselage, utilizing ground handling equipment.



Extra to fly in the U. S. Air Force

airline service equipment to come out in smaller packages, including the new 1 and 1/2 ATR nac rest, reflecting greater use of maintenance tools. For example, Collins Radio Co.'s new Select (selective calling) amplifier and receiver amplifiers each come in a 1 ATR, while Radio's new receiver receiver, available in factory, also comes in a 1 ATR container. Plessey has ordered 15 of the new MKA7 flexible matrix receiver for installation in its DG-7s.)

►Gale to Toss—Although the battle between Tera and DMIC apparatus continues unabated, one of the proponents has succumbed to the point of composing the following "Ballad of Amazing Tera," to be sung to the tune of "Davy Crockett":

Shut on a table top at IRT
To rest on a flat top on the
high end
Grabbed by the Air Force when it
was only "there"
Offered to the world to replace
DMIC.

GEORUS Tera, amazing Tera,
the U. S. community

Works like a charm on a Navy plane
CAA wonders who's to blame
NAPA says it's all in vain
(Cause it won't fit in their mem-
ber's plane)

GEORUS Tera, amazing Tera,
the navigation aid of fear

It sends a lot of frequencies
But it will give a ship accuracy
Though marveled by the time and
the time, too soon
They forgot to reckon with the
AND B

GEORUS Tera, amazing Tera,
it walks so marvelously

►Keyhole to X-Ray Tubes—Radicon Manufacturing Co. has completed a facility which will enable it to make X-ray photos of 10 vacuum tubes simultaneously, to detect welding or assembly faults which can not be spotted by microscopic examination. The Raytheon facility consists of a lead-lined (shielded) room measuring 6x10x15 ft. and a 100,000-volt X-ray machine. Company reports that X-ray inspection already has disclosed two flaws in the welding of minute turbine parts which appeared to be perfect under a high power microscope.

►New Radio Techniques—Hughes Aircraft is developing a new anti-aircraft network which employs cross-type stations and tracking wave tubes, in combination with digital data handling and processing equipment.



Ignition . . .

**on Orenda
Jet Engines**

*...power plant for the Astro
CF-105, formidable
fighter-interceptor
on duty with the
Royal Canadian
Air Force in the
defense of Canada
and the North
American continent.*



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to first supersonic world speed record!

Just moments after the top white control bursts into the air, she's here and gone! Day or night, above the thunder from her jets is heard 43,000 feet below. It's the Air Force North American F-100 Super Sabre streaking into victory's hall of fame in 1955. M.P.H.—world's first supersonic speed record. And should, to present pilot, Col. H. A. Humes, U.S.A.F., in precision light Air oxygen and "Anti-G" equipment.

Leading aircraft makers use the Military depend on Air research and development for equipment to meet today's needs—and to be ready for tomorrow's. Nobody knows when God, Humes' record will be broken. But it's a safe bet that where it is, Air equipment will be ahead. For details on how Air can serve you, write:

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Master Oxygen Converters, Oxygen Regulators, Pressure Regulators, Control Valves, Relief Valves, Air & Vacuum Air and Oxygen Systems, Actuators, Actuators and other Aircraft Accessories.



ARO Liquid Oxygen Converter—converts liquid oxygen into gas for use in aircraft.



ARO O-2 Oxygen Regulator—converts liquid oxygen into gas for use in aircraft.



ARO 'Lead O' Vacuum Air and Oxygen System—converts liquid oxygen into gas for use in aircraft.

NEW AVIATION PRODUCTS

Components & Devices

●Medium-power transistors, germanium Type 2N85, 50 and 57, are introduced for Class A or B output or driving stages. A pair of 2N85 transistors, operated push-pull Class B, are



designed to deliver output at temperatures up to 70°C when mounted on an aluminum chassis which serves as a heat sink. Units are hermetically sealed under vacuum. Transistor Electronic Corp., Victoria 75, Mass.

●Printed circuit connectors, Series PCC, employ novel helical-type construction which enables them to function satisfactorily despite a 0.004 to 0.071 in variation in the thickness of a 4-in. supported printed circuit



board. Special construction allows available in 2 in. based. Connectors are available in single or double, pin configurations with 4, 16, 18, 19, 22 or 27 contacts. DeLong-Aerospace Corp., 4500 Northern Blvd., Long Island City 1, N.Y.

●Miniature vacuum fixed capacitors, Type JCSF, called smallest to the market by their maker, accuracy each 1% in value, 10 to 100 pF. Units are available with capacities of 25, 40, 60, 100 and 150 pF, at voltages of 75, 100, and 150 v. peak. Unit's small size, low resistance and negligible dissipation factor make it suited at higher frequencies. Jennings Radio Mfg. Corp., P.O. Box 1273, San Jose, Calif.

●Vacuum tube shock mount, Model K271, for vibration isolation of radio valves in critical applications.

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

By Morris Miles,
Senior Member, Aviation Writers Assn.



It's regrettable that you engineers don't have somewhat the same opportunity to observe the Wm. R. Whittaker Co., Ltd. that is afforded outside accountants in auditing the company's books.

Almost inevitably—after they've gone over the records and noted the value firm's alert progressiveness, its friendly, informal atmosphere and the many benefits accorded employees—they apply for work as Whittaker accountants!

I feel sure if you could see the Whittaker engineering setup in Southern California, and find in one thriving, modernized company the opportunity, the salary and the working conditions you perhaps long sought—you, too, would be filling out an application form.

Why?

Because Whittaker is hardly an engineering firm. Its president and founder, Bob Whittaker, is an engineer. Virtually all its employees are engineers. It has what I would call an aura of engineering—of ingenuity and understanding for the effort and capabilities of the individual expert.

The best recommendation I can think of is engineers themselves. As any one of the veterans who have been with the company so long, or many of the younger men who they help to recruit, will Whittaker for years to come.

They'll tell you they like Whittaker's pleasant engineering system, which allows a man to follow a given job from proposal to acceptance and final stages of production—and even into the field, if necessary.

They'll tell you they like a department with an almost daily, personal contact with the company's engineers, who are also known to the field, where the advancement of smaller valves into the larger size divisions, where engineering is the by-product rather than a mere means.

And they'll tell you they appreciate Whittaker's informal atmosphere, so unlike the engineers of the big plants where a man can be lost from sight and his ideas lost with him.

There are the things that count with engineers, even above salary. Enough personal opportunity, the right environment, and the tools to work with. Whittaker provides these in the following ways, plus the more material things such as salary and benefits.

You'll find Whittaker pays for ability and achievement, correctly it will, perhaps better, than other firms in the industry. But are the benefits forgotten?

Take the profit sharing retirement plan, for instance. Each year the company contributes to a trust fund 12% of the total base earnings of each plan participant (the maximum allowed by Treasury Department regulations) but not more than 25% of the company's net profit before Federal income taxes.

Then there are other benefits—a pension plan for the employee and his family, liberal vacations, holidays, etc.

And, in addition, if you are an engineer who qualifies for the bonus plan, you share annually in a total pool of 5% of the net profit before taxes and after the most contribution. Participation is on the basis of salary and seniority, and has increased through the years for each year.

Why are I telling you this? Simply because Whittaker needs engineers and good engineers. The need has been created by company expansion, the purchase of other firms, and the consequent drive to build them up to a point with the original firm. R. Whittaker Company, which has led the aircraft valve field since World War II when it came with the first semi-automated, pilot type fuel valves.

And it's still leading—under the largest volume of business in its field today, and looking forward to the challenge of tomorrow.

So, if you're an engineer—no need, certainly of company, where an engineer's main opportunity in research, or a man experienced in mechanical engineering, or a man who has worked with Jack Whittaker, President, Wm. R. Whittaker Co., Ltd., 953 West Center Avenue, Los Angeles 33, Calif.

But first—check page 38.



trade excess weight for extra range with TI transistorized electronics

Utilizing high temperature silicon transistors... developed and mass-produced by Texas Instruments... the transistorized amplifiers illustrated weigh at least 90% less than comparable vacuum tube models. They are approximately 50% smaller... and require only a fraction of the power needed for vacuum tube equipment. Such TI transistorization achievements help solve the aircraft industry's toughest design dilemmas... units which electronic apparatus with less weight, TI transistorized equipment and systems... lightweight, compact, shock resistant... all military aircraft manufacturers in designing for increasingly greater speed and range.

At TI, extensive military design and production experience is reinforced by leadership in transistor manufacture. Silicon transistors, mass-produced only by Texas Instruments, far exceed MIL-T-54100 temperature specifications and more than meet all military engine-mount specifications. The world's leading transistor manufacturer, TI also produces semiconductor transformers, deposited carbon resistors and other precision components for high efficiency operation in transistor circuits.

Call on Texas Instruments to design and manufacture reliable electronic systems that will help solve your weight and space problems. You can depend on the experience and ability of TI application engineers. For further information, write to Texas Instruments, Application Division.



TEXAS INSTRUMENTS
INCORPORATED
3000 LEMMON AVENUE DALLAS 5, TEXAS



control metal sleeve for separating tube. Flexible electrical leads attached to the base of the tube socket give shock mount required freedom of movement. Robinson Aviation Inc., Teterboro, N. J.

Microwave Components

■ Heavy duty pulse transformer, Type D1111C-10, delivers 15,000 volts at 125 nsec. One is designed to operate with pulse widths of 1 μ s and has a rise time of less than 1 μ s. Duty cycle is 4 milli-seconds maximum. Microwave variation of output pulse from nominal pulse value exceeds a less than 1%. Transformer is hermetically sealed and oil filled, with bellows-type expansion drum. Fisher Engineering, Inc., Huntington, Ind.

Laboratory Equipment

■ Oscilloscope "memory" is an attachment for use with electronically deflected CRT's... can provide real-time storage of waveforms initially displayed on the oscilloscope. Wavetek can be



used at will from the new Micro-Scope. For application data, write to Advanced Electronics Mfg. Corp., 2025 Parnassus Ave., Los Angeles 25, Calif.

■ Sweep-Sine, Model 300, is an electronic synchro generator which produces a linear time-base sweep that is smoothly synchronized with an external reference signal to permit the shape display on an oscilloscope. The vice can be used for distortion observations of shape testing during frequency tests, for checking the motor cycle during variation of pulse repetition rate, or for continuous monitoring of rectifying diode frequency response tests. Price is \$180 FOB. Chalmers Electronic Co., P. O. Box 321, Menasha, Calif.

NEW AVIATION PRODUCTS



Film Reels Rocket Fuels

A thin slice of Rolochrome acetate means only 60-65 lbs. of fuel in long effort in protection for delicate instruments during extreme current atmospheric conditions. It will withstand burning nitric acid and hydrazine, which are used as rocket fuels.

The film has a tensile strength of 25,000 psi and a high dielectric strength over a wide range of temperature and humidity conditions, per-

mitting a positive and long-term resistance for accelerometers, gyroscopes and other electronic components.

W. S. Skidmore & Co., Calver City, Calif.

Timer Clocks Machine Guns

Automatic chronograph measures velocity of bullets fired from rapid fire machine guns. The device measures the number of rounds fired per minute



4 out of 5

helicopters under 400 hp.
produced this year will
have power by



AIRCOOLED MOTORS, INC.
SYRACUSE, N. Y.

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Export Distributors of Aircraft Products

Valve Helps Balance Fuel Tanks

Hydro-mechanical fuel balance system helps correct air gravity within 1% of mean aerodynamic chord through automatic equalizing of fuel tanks widely dispersed from the CG. Control unit senses fuel levels and fuel distribution to control valve down above which operates shut-off valve between tanks.

Control fuel level difference is held to plus or minus 1 in. over the entire range of flow, temperature and height attitudes up to 20 degree climb or dive.

Common is using this system on the new F111 model.

Fuelco Aircraft Co., 5827 W. Century Blvd., Los Angeles 45, Calif.



Stand Tests Hydraulic Accessories

New test stand gives performance data for almost all hydraulic system components and accessories, including valves, regulators, cylinders and actuators.

The test unit variable pressure pressure control relief valves. Variable down up to 10 or 20 gpm are obtained by manual adjustment of a variable displacement pump.

Model 1263 is weight is 1,500 lb. Dimensions are 7 ft. long, 16 in. deep, 70 in. high.

Auto Control Laboratories, 3665 Selma Avenue, Calver City, Calif.



WHAT CATEGORY OF ENGINEERING INTERESTS YOU?

Lockheed's Georgia Division Engineering Division, long range expansion program requires qualified engineers in all fields: Design, Research, Laboratories, Structures, Flight Test, Dynamics, Preliminary Design, Operations Research....

Advanced projects in large aircraft categories, Cargo, Bombers, Logistic Carriers are among the complex and interesting assignments in which this organization is actively engaged.

Qualified Engineers interested in becoming associated with the progressive Engineering Organization are invited to write to us to complete confidence.



and the individual velocities of each wheel. The sensing devices are two photo-electric detectors spaced far enough apart that no two wheels appear at the same time. From 10 to 9,000 revs/min can be measured.

The system also consists of a data recorder and a data processor. Another feature of the chronograph is the coast timer, pulse generator which, upon receipt of a strobed signal, transfers the data from the time of flight counter to an accumulator in pulses, thereby introducing new information into the accumulators as it is received.

Potter Instrument Co., Inc., 115 Cutter Mill Road, Great Neck, N. Y.

Portable Hydraulic Tester

A portable hydraulic test machine has been designed for use aboard aircraft carriers, on aircraft shops and industrial quarters where equipment or work calls for a low-cost, convenient machine.

Available in 10 and 20-gal. capacities, the lower stands 32 in. high and the latter 56 in. Both models are equipped with pneumatic tires on ball bearing mounted wheels.

The machine is used to test the performance and operation of hydraulic systems and components of aircraft and other equipment. They drive and filter the hydraulic fluid and hold the hydraulic system. Leaks can be detected whether external or internal.

Guar. Hydraulic, Inc., Jamaica 36, L. I., N. Y.

Enclosed Aircraft Motor

Aircraft motor suitable for blower drive, pump drive, etc., delivers 1 hp continuously at 5,700 rpm, operates on 115 volt, 60 cycle, 208 v. a.c. Starting torque is 4.5 lb. moment at 100% speed.

Type SDVA motor weighs 6.1 lb., is cooled by a fan which blows air over the side of the frame. It is also available in explosion proof Type SDVA. Aircraft Div., U. S. Electrical Motors Inc., Box 2948, Los Angeles 54, Calif.

Fitters for Argon and Jet Fuel

These new argonite filters for handling both aviation gas and jet fuel at a rate of 225 gpm. while removing

PANELOC announces a new rotary latch



Seven Cost • Seven Times Seven Space • Seven Weight

This new Paneloc Rotary Latch is a simple and economical, strong and durable fastener for access panels, electrical control panels, inspection doors, machinery doors, and other hinged or removable covers. It permits a large access opening, opens quickly with a quarter turn. Easy assembly on access panel & nut, eliminating every installation step, no special tools required. Only four simple parts made of steel columns plated. Three of them are available, more to be added. Special sizes and finishes available on order. Cost very low, performance unsurpassed. Write for a catalog and price list for your file.

PANEOC—America's most versatile line of steel fasteners... Battery Latches, Storm Latches, Panel Latches, High Performance Fasteners, Day Locks.

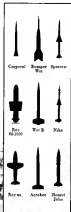
Paneloc is a product of Sealed Air Corporation, Inc. 1000 Main Street, North Andover, Mass. 01845. (603) 881-1111. (In Mass. 881-1111). (In N.H. 881-1111). (In N.J. 881-1111). (In Pa. 881-1111). (In Va. 881-1111). (In W.V. 881-1111). (In Md. 881-1111). (In Del. 881-1111). (In N.C. 881-1111). (In S.C. 881-1111). (In Ga. 881-1111). (In Fla. 881-1111). (In Ala. 881-1111). (In Miss. 881-1111). (In Ark. 881-1111). (In La. 881-1111). (In Tex. 881-1111). (In Okla. 881-1111). (In Kan. 881-1111). (In Neb. 881-1111). (In Wyo. 881-1111). (In Colo. 881-1111). (In N.M. 881-1111). (In Ariz. 881-1111). (In Nev. 881-1111). (In Id. 881-1111). (In Wyo. 881-1111). (In Mont. 881-1111). (In Wyo. 881-1111). (In N.D. 881-1111). (In S.D. 881-1111). (In Minn. 881-1111). (In Wis. 881-1111). (In Ill. 881-1111). (In Ind. 881-1111). (In Ohio 881-1111). (In Pa. 881-1111). (In N.Y. 881-1111). (In Conn. 881-1111). (In N.H. 881-1111). (In Mass. 881-1111). (In Vt. 881-1111). (In N.J. 881-1111). (In Del. 881-1111). 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Growing importance of missiles in the nation's defense has led to the separation of missiles engineering from aircraft engineering functions at Douglas Aircraft Company. Leadership in this important field has been won by Douglas in 14 years of development and design of guided missiles for the Armed Forces. Douglas is currently engaged in eight major missile projects, under contracts from the Air Force, Army and Navy.

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all of the water and better than 95% of the solids have been put on the market.

Two of the models, PASF-225 and PASF-275H, are Navy-approved. They are constructed of aluminum bronze. Both models meet MIL-F-5505 specifications.

The third filter is a commercial adaptation of the military separator filter, a horizontal two-stage separator identical to Navy model PASF-225. The unit has a steel body and aluminum diaphragm plates and clearest parts and can be mounted horizontally in the rear bucket box compartment of tankers or on carts.

Pameter Products, Inc., Rahway, N. J.

ALSO ON THE MARKET

Battery table, Ferguson No. 36, has an 8 in. diameter top with 2 x 14 in. T slots allowing it to rest on a base for a 14 in. loading plate. Table is graduated 50° and turns lock is positive through zero and goes with 40:1 ratio—Chicago Tool & Engineering Co., 535 S. Chicago Ave., Chicago 17, Ill.

Pocket-sized surface comparator permits metal surfaces to be compared with a standard standard for roughness under 10-powder magnification. The in-



strument is self-illuminated with two low-light batteries and a standard TV-4 flashlight lamp. Price: \$30—Bendix & Lomb Optical Co., 675 St. Paul St., Rochester, N. Y.

Stevens-Simpson centrifugal separator also furnished in separate packaged unit. Controls within up to three independent government for control of multiple or water related inputs. Applications: in-charge radar equipment and guided missile control—Long Engineering Products, Inc., Bedford, Ohio.

PLASTIC-ENCASED HEATER ANOTHER **SAFeway** FIRST



Standard in use is protected by rigidity of resistance plate—non-flammable, non-toxic, non-oxidizing.

Well-insulated element, measuring 12" x 24" x 1/2", is 240° F. rating, made for the Safeway Manufacturing Company for use in metal-to-metal bonding.

Method Evolved by Pioneer in Field of Woven Heat Elements

New Melted Salt Provides Own Structural Support

A method has been devised to enclose woven heat units within rigid, fibrous reinforced plastic. Where exposed to constant heat with high pressure strength, these elements, molded into various shapes and sizes, are ideal.

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Highly ductile characteristics are an exceptionally broad temperature range of -100° F. to more than 400° F., excellent dielectric qualities, and protection of the heat unit itself against damage.

Diversity of Applications

Reinforced plastic heat elements have countless uses, notably in an-

swers as heaters and frost-free. In other industries, these are innumerable applications, such as direct, warming coils, heating trays and molds, oil-heats, bonding fixtures, stretch films, dies, and food warmers.

Many Uses Still Unexplored

The vast potential of this product lies in many fields beyond our experience. Safeway engineers would like to confer with you if your heat problems might possibly be solved by the use of safer-made reinforced plastic heat elements.

Insurance Available

Reinforced plastic may be more effectively applied with neoprene or silicone rubber insulation. For your copy of a fact-filled folder, write us:

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Applying the modern "weapons system" concept to the problems of supersonic propulsion, Olin Mathlieson, Reaction Motors, and Marquardt Aircraft are combining their unique skills and experience in the development and production of rockets, motors, and special

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Abstract Abstract Content



Olin Matheson Chemical Corporation



Executive Summary 1



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in the field of basic research, Otto Matthieson and Boertien Matton are developing new food and solid propellants as well as additives to improve current propellants. Boertien Matton and Margaretha Aarnish establish specifications for these new rockets and rocket fuels and test and evaluate their capabilities for meeting tomorrow's needs.

On 'Super Secrecy':

Sound Thinking . . .

I have just finished your editorial of Oct 10 (page 95) in *AVIATION WEEK* and wish to compliment you for the sound thinking it describes. Well done!

ROBERT L. SARTON
Executive Vice President
Balsch Products Corp.
Bayside, N. Y.

Or Security Error?

What is this "super secrecy" policy you speak of, as you indicated appearing in the 11 October issue? Are there the policies that make it so easy for publications and an AVANTIAGE LINK to abuse information national on contemporary technology? Some say, in fact, to the point of saying that those that classified it as you. The fact of the matter is that we have today such a free exchange of military information that the constant operational delays in the dissemination of security has made treasury a pile. The Russian does need, and if they need to, a subsidy to all of the leading trade publications. It's all there, in print, in photo, in

put that the "press" use better judgment in the light of our security problems. Statistical information on a new protocol would be "hot news" and help circulation, but the public does not "need to know" the details.

Your article in the cattle was detailing "LEAF Tactic for Aerial Warfare" is a good one in point. It was interesting, but the only concrete purpose it served was to help the farmer. I think if you checked, you might also find me not fitting with society values. I imagined the Hughes equipment which you photographed and according to me information, it is classified CONFIDENTIAL.

Gregory B. Eddy
Elliott M. Mott, Jr.

EDITOR'S NOTE: READER DADDY SHOULD KEEP HIS FILES UP TO DATE. THE MATERIAL HE GETS IS STILL LABELED "CONFIDENTIAL" ON NOVEMBER 3, WAS OFFICIALLY CLEARED BY THE DEFENSE DEPARTMENT FOR PUBLIC USE ON SEPTEMBER 10.)

Reply to NATA

Your letter column of October 10 carries a note from a Mr. Charles Parker, Executive Director of NATA, claiming to sympathize with Bennett-Worner's complaint of the industry's government protectionism against imported waste exporters. He takes as his task for "disorganizing industry organizations and Washington representatives," not joining NATA and not trying to "help waste as organized effort."

"We were not aware that the administration of justice, which is all we asked, required membership in Mr. Fisher's NAACP or any other of the more than eighty various organizations, churches, fraternalists, social clubs, labor unions, clubs, confederations, corporations, committees, council's, boards, ponds, committees or other recognized or non groups in the country today."

[illegible]

We are positive that Mr. Baker's personal organization could resolve the complex issue in question, because he himself says that it is working on the problem right now and are sure that the present growth of the problem is probably just coincidental anyway. We certainly wish him and the

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CONVAIR Engineering Personnel Dept., A
Fort Worth, Texas



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NOTA the last of all last, too, in the Washington appointment, in my level that General Motors is really of design, and to prove it would like to offer the first aircraft that by now return top levels who have reported strong public and private sponsors about the economic content of representative issues in Washington today. However, somebody has to keep writing an airplane as there will be no industry to have to make sure organizations representing it, and more willing to be the ones to do it, since it is more giving up some of the technology budget and saving some of the conversion. One again in the future.

William F. Bennett
Bennett-Wynn, Inc.
London Field
St. Louis 24, Missouri

Strike at Arms

Continue please! The most data on the "Year 2000" in the October 24th AVIATION WEEK stated that Arms management has offered a 5% wage increase to its engineering employees who are represented by the Engineers Association of America, an affiliate of the Engineers and Scientists of America. In actuality, the management offer was only \$4 per hour, not 5%.

There is a great deal of difference between these figures. A 5% increase in the average engineer's average salary is only a 2.5% increase. For salary increases, it would come out to only 3.8% increase.

As was recently stated in your article, management wants to "get it right" long before we are here. These "Year 2000" are very important to the professional development of the Arms engineers and provide assurance of far-reaching conditions. For instance, Arms management wants to run the annual pay offered the most and length of service increase from 10% of the total profit to a merit pay pool of 15% of total profit to be more incentive. The 5% contribution would not include personnel in administrative, clerical, support or those who have reached the maximum of a given salary range.

Arms management also is demanding the elimination of the pay premium clause which provided that individuals paid pay increases or bonuses not explicitly covered by the contract would automatically be raised and, again, they asked after respect negotiation to make Arms a less desirable place to work.

Although the members groups of the Engineers and Scientists of America often discuss, we still feel that it was necessary for the Arms engineers to take strike action to protect the Arms Company from the unreasonable demands of management. We, along with the Engineers Association of America and will be working possible to avoid those as we did in 1953, in this struggle.

John E. Turv
Vice President
Engineers & Scientists of America
175 Millside Avenue
East Williams, New York
[Arms Week and Management's offer was \$4, not 5% as reported—Ed.]

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1975 Dr. Arthur Kesteven, noted authority in gas dynamics, member of Avco Advanced Development, and professor, Cornell University.

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"Technical sophistication"

1975 Dr. E. R. Poon, former chief Scientist and Deputy Chief of the Office of Naval Research and Avco Y.R. and Chairman of its Committee on Advanced Research.

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"An atmosphere of inquiry"

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1975 Dr. Mico C. Adams, noted assembly scientist, author of papers on introduction and gas dynamics, and Director of the Avco Research Laboratory.

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Write Dr. E. R. Poon, Vice-President in Charge of Research, Room 405, Avco Advanced Development Division, Stratford, Conn., or Phone Bridgeport, Conn., (203) 641-1111.

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WHO'S WHERE

(Continued from page 9)

Walter G. English, former of Armco Corp. Other changes kind & Manning, general manager, and Don Kagle, control manager of the Jackson Div., George Lopez, plant manager of El Paso, Tex., a Jackson subsidiary of Armco Corp.

Dr. A. L. Wheeler, chief engineer, and Samuel Appleson, senior manager of Spring Coverage Co. Div. of Sperry Rand Corp.

James M. Mitchell, associate director of the National Science Foundation.

Sharon K. Horne, senior sales engineer of the new West Coast office of Sperry Systems Corp. Div. of General Motors Corp.

S. Alfred Walker, public relations representative of General Controls Co., Glendale, Calif.

William J. Cook, senior sales engineer of Delco Div. of General Motors Corp. J. C. Lander, sales manager for Delco Cor. Tech. Organization.

Clifford A. Bonds, advertising manager for Pratt & Whitney Co., Inc.

Raymond E. Jacobson, manager of component and subassembly sales in Electronics Div. of Radio Shack Corp.

Thomas Linder, Jr., manufacturing manager of Chrysler Corp.

Frank A. Roberts, Washington representative of Chrysler Corp.

William A. Dixon, appointed to the Sacramento staff of California Agricultural Commission.

Joseph M. Wilkins, agency and interface manager for Japan Air Lines' Los Angeles office.

Thomas J. Howe, director of cargo sales for American Airlines, Theodore F. Goetz, sales manager for the Pacific Area.

Donald B. Spivey, general sales manager of Press Products Div. of Ray-Walter Corp.

Kenneth E. Seifert, regional sales representative for Denver Research & Development Lab. of Raytheon Co.

Ken Allen Josephson & Ruggi (Inc.), Washington office of Cook Electric Co.

Harold L. Dinger, general sales manager of S. J. Hollingsworth Corp.

John F. Higgins, manager of independent product development of contract div. of Ray, Inc.

Paul O. Monodelli, manager of electro-mechanical div. of the division.

J. W. Mack, sales manager of JAC York Plant Div. of General Motors.

Other changes: Frank E. Ray, marketing systems manager; H. B. Wright, manufacturing coordinator; James J. King, fuel pump area marketing manager; Donald A. Howe, marketing specialist; Robert J. Clark, chief engineer; James H. Burkhead, manager of technology dept. of Westinghouse Research Lab.

R. Schindler, representative of Westinghouse, Inc.

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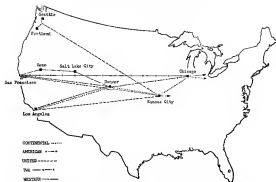
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AIR TRANSPORT



MAP SHOWS the important new regional and transcontinental routes needed to free airlines in the Denver service area.

Regional Carriers Win New Western Routes

Washington—Greater competition and a strengthening of western regional carriers are the major factors in the Civil Aeronautics Board Denver service case decision.

The Board went beyond the usual boundaries of its case in the case (AW Aug. 3, p. 95) and added competition between United Air Lines and Trans World Airline at Denver and Kansas City to the new routes suggested for Continental Air Lines and Western Air Lines in the eastern's report.

Here are the new routes and services awarded:

- Continental, a new route between Chicago and Los Angeles via Kansas City and Denver.
- Western, a Denver to San Francisco/Oakland route via Salt Lake City and Reno.
- Denver is added to Trans World Airlines transcontinental route.
- Kansas City is added to United Air Lines' transcontinental route.
- American Airlines' route structure is adjusted to permit nonstop service between Chicago and San Francisco/Oakland.

At the same time, CAB issued a decision supplementary to the New York-Chicago case adding Pittsburgh to United's system. The new United service at Pittsburgh, subject to a long-haul restriction, is designed to improve service between Pittsburgh and points west of Chicago.

Follows CAB Trend

The Board also ordered an investigation to determine whether the present restrictions on American, United and TWA against regional stops at points not on their certificates should be lifted.

The order awarded Continental and Western follow a trend toward strengthening the position of regional carriers which appears to be developing in CAB treatment of the major route cases which are before it this year (AW Oct. 16, p. 175). According to the decision in the Denver case, these route awards were made to improve regional service in the area between Chicago and the West Coast, and then can substantially strengthen the positions of the two small trunklines, especially that of Continental.

The Board estimates that the new routes will mean an additional \$5,072,000 in revenue and a \$180,000 reduction in subsidy for Continental Western should have a profit of about \$1 million on its new Denver-San Francisco route, according to the CAB.

Both carriers are restricted in their new services. Continental's flights between Kansas City and Chicago must originate in Los Angeles, and the carrier cannot operate single plane service between Chicago and points north of Kansas City. Single plane service to points on the new Los Angeles-Chicago route cannot be operated from points north of Denver.

Rumored Examiner

Western is prohibited from operating a through plane service between San Francisco and Reno and points other than Denver which are north or east of Salt Lake City.

CAB received the eastern's finding that a Continental-Capital Airlines interchange answers the need for new transcontinental service at Denver and Kansas City. The Board prefers

WHAT DO YOU KNOW ABOUT AVIATION...



Who Was the Father of Jet Aviation?

Far back in 1909, a young Frenchman decided that there could be a different type of aircraft other than the then currently accepted "kite" models. Putting his ideas to work, he built a plane powered by a turbopropeller, with a fuselage of slender silhouette, a delta-form tail assembly, a retractable landing gear and wings of polished plywood. In April, 1910, his revolutionary plane took off—and flew. The young man's name was—and is—Henri Coanda.

Today his ideas have reached fruition in the modern age of jet transportation. Still alive, he typifies the spirit that has kept France to the fore of international aviation... the spirit that has enabled Air France to successfully serve the people of 74 countries for 37 years.

Henri Coanda today



The first jet aircraft



The jet engine of the Coanda motor developed in 1909.



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Size and shape of wing leaves show up clearly in this recent flight photo of Sonore S. E. 220 Concorde. In 73 flight tests, the Concorde has flown over 190 hr. Air France is placing an order for 21 of these medium range jet transports for operation on overseas routes of the French Union. Other French carriers, with which Air France recently agreed to share en route routes the Union, will place orders soon.

Sucase S.E. 210 Caravelle

adding the points to TWA and United.

The Board and the proposed interchange would be referred to a single carrier transcontinental service in addition to schedules submitted by Capital and Continental which would offer "a milk run type of service."

The Board also expressed the fear that the problems of developing new airport service and transcontinental interchange service might result in Continental concentrating on one to the detriment of the other.

Cash Payments Factor

In choosing TWA and United, the Board and the customer didn't go far enough in giving Denver a second transcontinental service but was too concerned with protecting the airport market.

A major factor in the choice of TWA over American for the new Denver service lies in the fact that TWA is a more vigorous proponent of airport service, and the CAB feels that Denver needs better development of its coach potential, especially in such points as New York and Washington.

TWA's authority to serve Denver is restricted so that Denver must be served on the same flight with Kansas City or St. Louis. Traffic between Denver and Los Angeles and San Francisco is subject to a long-haul restriction.

The CAB feels that Kansas City, like Denver, needs improved transcontinental as well as regional service. Confirmation of United at Kansas City goes that city's first single plane service to the Pacific Northwest and will offer the first competitive single plane service to San Francisco. United and Continental will be able to offer competitive service from Kansas City to Los Angeles.

United is restricted from serving Kansas City on flights arriving Denver in Chicago, protecting Continental and Borel from traffic Denver.

Competition Not Cited

The CAB discounts the devices to be offered by United and TWA from this creation of points that are inherently strong points. The Board feels that what United loses to TWA at Denver it will pick up from TWA at Kansas City and vice versa.

The modification of American's route to prevent overlap service between Chicago and San Francisco is the result of a CAB finding that the route needs a third competitive routing service. Currently, American has to make a stop at Tulsa, Dallas/Ft. Worth or a point further west.

The Board reports proposals for American overlap authority between Los Angeles and various points east of Chicago, particularly Denver. The Board feels that a Detroit-Los Angeles overlap service for American would overshadow the recent one-way introduction for the route given to TWA in the New York-Chicago case.

North American Rejected

As in the New York-Chicago case, CAB rejected the application of North American Airlines for a route. In addition to the reasons already in the New York-Chicago case—lack of sufficient demand for the route and the CAB's desire to protect the Chicago market—the CAB feels that the route would be a duplicate of the Chicago market.

The Board points out that the unscheduled carrier couldn't supply the through service to eastern points from Kansas City and Denver.

Also, North American would be more interested in the long-haul business on the western routes and wouldn't provide the proper regional type service, according to CAB. North American has no interest in what the Board's decision is as a result.

CAB Vice Chairman Joseph F. Adams disagreed with the majority treatment of North American. Since he is in the case as a dissenting voice, he would defer action on the unscheduled carrier's application until the facts have reached their decision.

Dissenting Views

A dissent from the majority opinion was filed by members Chan Garney and Homer Doree on two points. They feel that the creation of Continental in Chicago and TWA from Denver to San Francisco "represent alleged and reasonably expected route extensions."

According to the dissent, extension of Continental in Chicago offers an additional improvement of service to the public, and the competition of other stronger services on the routes will mean lower fares to Continental.

Referring to the fact that Continental has been designated as a regional carrier, Garney and Doree pointed out that the carrier is now and likely to be a long-haul operator and that such a reclassification cannot be successfully accomplished in one great step, and it does the small regional carrier a disservice to attempt it.

On the Denver-San Francisco route created by TWA and Western, the dissenting members said that there is room for only one of the two carriers, and that route should be awarded to Western.

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ACC Group Proposes Integration Of Civil Airways, Air Defense

Washington—An air traffic control concept based on prescriptive integration of military air defense equipment and civil services to form a common airway system has been proposed to the Air Coordinating Committee by its Special Working Group 13. (A similar proposal was recently made by the technical director of USAF Base Air Development Command, at AWP Nov. 7, p. 17.) Other proposals include:

- **Visual Flight Rules** will not apply in areas where the density of traffic and the speed of aircraft necessitates the use of positive Instrument Flight Rule controls regardless of weather. The SWG-13 report notes that improvements in air traffic control is necessary in these areas before instrument rules can be applied without economic and operational penalties to the users of the system.

- **The Common System** concept must permit development of a traffic control system compatible with all aircraft using the common and pilot capabilities. This is the first time that a Federal group has recognized the steadily widening gap between the performance capabilities of different classes of aircraft and the proficiency of pilots flying them.

- **Continuation of** and **interim** traffic control system which would include use of both military and civil rules to expand coverage, use of short pilot-to-controller voice radio communications, application of improved methods of transferring and displaying control data.

- **Priority** is given to extending order control to cover large, multiple-airport terminal areas and high density enroute areas. Key to successful early use of long-range order, the group said, is a combination of a large scale blow-up of a radar display that is bright enough to be used in conjunction with a simplified pusher system.

- **Interim effect** of the traffic control problem does not call for new developments since there are now available devices that can be added into early use. The interim system should have such advantages as providing related separation of aircraft to bank control boundaries, greater flexibility in sorting which will provide the required capability of area traffic control, efficient reintegration of jet traffic with conventional piston powered aircraft.

The group was particularly careful in its recommendations regarding different classes of aircraft and pilot capabilities. The report said the current Common System must consider the need of different users by providing:

- A segment of the overall concept designed to handle users with minimum equipment.

- A segment of the concept to provide maximum for the fully equipped user.

- **Separate airports** for different categories of traffic in areas of high density. The final decision on the SWG-13 report is dependent on the review of NAVFAC of the ACC. The panel has until Dec. 5 to evaluate the report. The group was headed by Sen. Stennis, a former American Airlines pilot and now on the Air Navigation Development Board.

Two basic facts were accepted by the group before they investigated air traffic control:

- **Needed improvements** in air traffic control are not being developed and adopted quickly enough to keep pace with the increasing demands of the system.

- An **unfavorable balance** between the demands on the system and operational capability exists.

Specific operational limitations, the report said, include:

- **Delay** and **disruption** to operations caused by **inadequate** limits, in spite of major improvements made in air traffic control over the last few years.

- **Excessive** military operations are not being handled when **increasing** control and other resources must be accommodated by the Common System.

- **The present Common System** is not capable of handling in a satisfactory manner the steadily increasing military jet traffic and integrating the traffic with the aircraft operating at the lower altitudes.

- **Means** for integrating high density helicopter operations with other types of traffic have not been developed.

- **Altitude** is used inefficiently in the present control concepts, with the exception of those limited areas where order control is now in effect.

- **Sharp** decreases in system capacity result when an **unanticipated** change in traffic flow is caused by a change in the weather or other circumstances.

SAS to Order U.S. Jets For Transpolar Route

Los Angeles—Tore H. Nierst, president of Scandinavian Airlines System, Inc., announced last week that the airline will soon announce an order for jet transports. They will be placed in service on its transpolar route in 1963.

SAS holds space on jet assembly lines at both Boeing Airplane Co. and Douglas

Airplane Co., but is expected to make its decision in favor of the Douglas DCA.

The Scandinavian airline has 14 Douglas DC-7Cs on order which will be placed in service on the Los Angeles-Copenhagen route next year, cutting the present flight time by nearly seven hours. Jet transports will easily outpace the DC-7Cs. SAS polar flights were begun a year ago, but flights on the polar route have averaged 71% in both directions. The operation was in the black after only six months, by which time the airline had 100% of the route with better than 90% on-time arrivals in Los Angeles and Copenhagen.

SAS plans to begin direct flights over the polar route by next summer and also will continue the transit service inaugurated in the last summer. Nierst reported 100% compliance of all flights on the route with better than 90% on-time arrivals in Los Angeles and Copenhagen.

CAB to Investigate Interline Agreements

Civil Aeronautics Board has ordered an investigation to determine whether interline agreements should be considered between the domestic operations of U.S. carriers and foreign carriers which are not members of International Air Transport Association.

The investigation resulted from a case involving National Airlines and Transpacific Airways Corporation of Philadelphia. National wanted an interline agreement for through passage over its domestic segment and TAN, presumably on the grounds that the resultant combination fares were below minimum rates established by the Civil Aeronautics Board. TAN objected to the Board that IATA minimum fares "cannot properly be interpreted as covering the combination of a late for a domestic segment with a late for an IATA segment carrier's fare."

Since most U.S. domestic operations are by IATA members, CAB warned that IATA restrictions "may effectively restrict the opportunity for non-IATA carriers to serve non-gateway points in the U.S. by combination over domestic segments" and ordered an investigation as to whether this is in the public interest.

Mexicana Buys DC-7Cs

Mexican de Avion, affiliate of Pan American World Airways, last week announced the purchase of four DC-7C 60-passenger transports from Douglas Aircraft Co. for delivery during 1957 and 1958.

The officials say the new planes will reduce the flying time on its Los Angeles-Mexico City route by an hour.

HERE ARE FACTS WHY

DME IS A SAFE INVESTMENT

There has been so much smoke and confusion about future navigation systems that the airspace is up to be filled with clear signals of navigation signals.

The situation has understandably bewildered aircraft owners and given them cause to wait and sit—until they realize that a navigation system which gives them both direction (info) and bearing (status) would greatly simplify their cross-country navigation and IFR operations.

These facts are now clear and cannot be disputed.

1. The VOR/DME system is fully developed providing highly dependable and accurate service. Congress has appropriated funds for construction of this system. There are 231 DME's in operation now and 175 more on the way or to be started on when additional funds become available.

2. CAA, in its 5 year navigation program proposed just made public, calls for 385 more VOR's and 648 additional DME's.

3. The Air Coordinating Committee, whose recommendations generally set National Air Policy, has issued DME operation for years to come. ANDR's decision earlier this year was not to adopt TACA, mostly to investigate its possible use in the Commerce system.

4. TACA is still in a very experimental stage as a common system element. In its present form it is really a medical navigation equipment. Conservative estimates say that four years would be required to set up complete ground equipment for satisfactory and airway use. No satisfactory design for airline or small aircraft TACA has been demonstrated. TACA does not provide voice communication or ILS procedures and these functions would require separate equipment if TACA were adopted as its present form.

5. Implementation of such a system on the airways to the new level of operations is VOR/DME today would require eight to ten years. This has been confirmed by CAA, ANDR and IATA.

6. There is no expense in any quarter as to the reliability, accuracy, or dependability of present day DME. It is recognized by all as being equally accurate as any other distance measuring system. It has been completely "de-bugged" and backed by a nation-wide service.

7. New, authorized DME approach procedures are already being published in the Aeronautics Guide and are being incorporated in the Jeppesen Manual as fast as received. These DME approaches provide lower minimums in many cases where terrain clearance has been a problem, reduce to a minimum in-flight procedures, greatly expedite instrument operations. Australia has made DME mandatory for enroute operations and pilot report DME for more accurate than other systems of using non-visuals and even for markers for positive indicators.

8. The conclusion which can be drawn by any close-thinking aircraft man is this:

- No other system can possibly supersede DME for a decade.
- VOR/DME provides today and in the years to come a highly superior navigation system with continuous positive indication without estimate, calculation or guess-work.
- Highly reliable, light-weight airborne DME is available today.
- Anyone installing DME in his aircraft can be assured beyond any question of doubt of getting a full span of usefulness out of his DME with no danger of rapid obsolescence.



If you would like more information on Narco Model UD-1A DME see your nearest Narco distributor, factory-approved service center or write to Narco National Aeronautical Corp., Ardmore, Pa.

Rizley Proposes Board Reforms

Civil Aeronautics Board Chairman Ron Rizley has proposed a number of changes and reforms for his agency as his first major speech since he took office last March.

Rizley called for a return to the basic principle of public need in dealing with route cases and other CAB matters in a speech at Read, O.A. Here are Rizley's recommendations:

- Revision of the Civil Aeronautics Act to reinstate the Ashland doctrine (AW No. 7, p. 118).
- Amendment of the Act to prevent operations of licensees and ability to be determined separately from cases involving questions of public need.
- Reorganization of the Act to bring a stronger focus on the public convenience and necessity on fact as well as theory.
- Facilitation of Board and staff members with actual operations of the airline industry.
- Close collaboration between Government and industry in negotiation of bilateral agreements.
- An overall assessment of industry representatives to meet with the Board to discuss current aviation problems.

Rizley said that the true test of public convenience and necessity tends to become redefined by arguments over which cases should justify new services.

The chairman from revision of the Ashland doctrine because of emphasis on the private rights of citizens, it de-emphasizes public need for new service and tends to make cases as large and unwieldy that it becomes impossible to argue at all of public need and integrated decisions.

In the long run, the effect of this is to give an advantage to the larger carriers which can better afford to prosecute a drawn-out proceeding, according to Rizley.

Rizley criticized the industry and Congress for the antagonistic pressures brought on the Board to force specific points of view in considering decisions. He said this pressure is not the best policy, since the Board is constantly harassed and may contract to them.

Rizley suggested an educational program which would include visits by the CAB staff to airline establishments. He defended the policy of using low airline transportation to accomplish this in view of CAB travel budget limitations.

A second educational suggestion was that an industry adviser be included on the U.S. negotiating teams which make bilateral agreements with other governments. He also suggested that in

doing representatives and efforts associated with aviation from an Advisory Assembly on Aviation to confer with the Board on general aviation issues.

Seaboard Proposes New Financing Plan

Seaboard and Western Airlines propose to turn its equipment financing over to a newly-organized firm, Air World Leasing, formed by principals of North American Leasing, and has a reported approval of Civil Aeronautics Board.

Fifty per cent of Air World's stock is divided equally (12.5% each) among three principals of North American: Stanley Weiss, James Fincham, and Lee Lerner, Kansas City. The other 50% stock is held by International Financial Corp.

Seaboard's application to CAB proposed that Air World purchase two DC-8s from Seaboard for \$1.3 million and acquire Seaboard's contract with Lockheed Aircraft Corp. for Super Constellation service. Seaboard would lease the DC-8s for four years, with option to buy, and would lease the Constellation for seven years, with option to buy.

F.B.I. Says Sabotage Behind United Crash

U.S. airlines last week found themselves confronted by an incident they had long feared—the successful sabotage of an American airline.

There had been aborted attempts in Los Angeles two years ago, but the first in actually used a U.S. airline down as it was a carefully planned sabotage. The crash of the United Air Lines plane outside Denver on Nov. 1, took the lives of all 44 persons aboard. Graham's motive to collect a \$17,500 travel insurance policy he had taken out on his mother, one of the victims.

Civil DME by Collins

Collins Radio Co. will market a civil DME set designed to work with the present Civil Aeronautics Administration ground stations. The instrument is similar to that in the field that the battle between TACA and civil DME may be ending in favor of the civil system. (See page 41). The set will be developed to Collins spec by Neco, one of two manufacturers now producing civil DME equipment.

KLM Orders DC-8s

KLM Royal Dutch Airlines will order Douglas DC-8s but will not become the first foreign carrier to conclude a firm contract for American jetliners. Value of the order, including spares, is \$12.1 million. Deliveries are to begin in March, 1969.

KLM says that the aircraft will be powered by Pratt & Whitney engines, presumably the JT5. However, an option of this engine assembly by Pratt & Whitney is being held in reserve. Douglas, however, has been awarded going forward engines as a safeguard against other availability of the JT5 as manufacturing performance data when JT5 models can be revealed to the airlines.

Among regions which Douglas probably has considered are the Kalamazoo Gateway and the Florida Gateway.

First route on which KLM will operate DC-8s is the Atlantic. Travel time between New York and Amsterdam will be cut to six and one-half hours from the present schedule of 11 hours and 15 minutes on half-hourly service.

Cost estimate of KLM's jets will be \$17,000 U.S., with a payload of 140,000 lb.

The crash and Graham's subsequent arrest highlighted the airline industry's lack of any real method (other than vigilance by airlines) to prevent sabotage. Immediately after the arrest, Civil Aeronautics Administration Field 8, Los Angeles, in conference with FBI, directed J. Edgar Hoover to direct "national type of preventive work" to detect explosives concealed in luggage, but there was little likelihood that any would be found within the immediate future.

Probably the best deterrent will be Graham's speedy arrest and the possibility of a prison speedy conviction.

TWA Places Order For Eight Super Gs

TWA World Airlines last week announced an order for eight additional Lockheed Super G Constellation with delivery beginning next June.

TWA's first placed Super G aircraft on its noncommercial routes last April and has 33 of the aircraft in service at the present.

36 total of Super and Standard Constellation aircraft in 1971.

The delivery of the eight new Super Gs will provide that of the previously announced 576 million under its 24 1600 Super Constellation (AW April 25, p. 117) which is scheduled to begin in early 1972.

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M541 M-1

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Airline Revenues—August, 1955

	Passenger Revenues	Mail Revenues	Express Revenues	Freight Revenues	Federal Subsidy	Total Operating Revenues	Total Operating Expenses	Net Operating Income (Before Taxes)
DOMESTIC TRUNK								
American Airlines	95,341,547	508,899	471,975	1,297,725	—	22,790,599	18,866,993	3,923,605
Capital Airlines	3,021,303	14,001	48,975	95,658	—	3,364,486	3,023,573	340,913
Continental Airlines	4,250,329	95,029	110,518	96,510	—	4,441,377	4,440,508	86,870
Delta Air Lines	4,376,791	41,038	15,134	15,134	—	4,448,098	4,448,098	—
Eastern Air Lines	5,806,522	30,963	10,781	37,288	11,281	5,896,132	5,380,574	515,557
Northwest Airlines	4,199,687	107,842	18,215	111,000	—	4,506,742	4,069,886	436,856
Trans World Airlines	13,071,023	274,462	193,872	298,479	—	14,134,448	13,154,887	979,561
United Airlines	8,819,081	66,297	30,883	154,333	—	9,069,594	8,508,588	561,006
Western Air Lines	1,057,025	2,344	9,516	19,055	46,682	1,109,580	1,029,484	80,096
Northwest Airlines	4,815,448	146,504	91,859	175,850	—	5,203,661	4,973,722	2,31,559
Trans World Airlines	12,347,849	348,972	300,234	410,600	—	13,407,655	12,355,487	1,052,168
United Airlines	10,985,330	499,732	429,300	506,579	—	12,420,941	11,464,467	956,474
Western Air Lines	2,864,022	68,074	36,390	59,979	—	3,008,465	2,844,384	164,081
INTERNATIONAL								
American Airlines	456,186	14,490	308	44,377	—	511,372	368,893	142,479
Capital Airlines	113,833	113,828	30,844	30,844	—	269,795	269,000	79,795
Continental Airlines	3,210	1,281	3,703	3,703	315	168,780	161,483	7,297
Delta Air Lines	135,230	4,297	1,100	1,100	—	140,726	132,487	8,239
Eastern Air Lines	408,984	4,739	806	806	—	414,535	403,144	11,391
Northwest Airlines	336,469	14,608	17,748	17,748	—	376,573	358,581	18,000
Trans World Airlines	306,716	3,318	1,810	12,306	—	324,150	300,240	23,910
United Airlines	1,218,490	459,284	5,782	797,238	—	2,480,794	2,377,798	102,996
Western Air Lines	500,000	17,000	—	10,000	118,000	635,000	470,000	165,000
American Airlines	8,860,000	481,000	—	514,000	510,000	9,865,000	8,780,000	1,085,000
Capital Airlines	5,815,000	911,000	—	710,000	510,000	7,036,000	6,814,000	222,000
Continental Airlines	4,870,000	283,000	—	390,000	—	5,543,000	5,483,000	60,000
Delta Air Lines	1,895,000	123,000	—	17,000	4,000	2,039,000	1,927,191	111,809
Eastern Air Lines	5,003,763	531,852	—	300,715	—	5,836,330	5,384,422	451,908
Northwest Airlines	1,375,335	33,075	—	1,342	—	1,408,712	1,360,399	48,313
LOCAL SERVICE								
Allegiance Airlines	396,090	10,434	10,594	10,594	—	427,712	375,518	52,194
Capital Airlines	125,551	3,324	1,873	1,873	—	130,721	118,000	12,721
Continental Airlines	46,495	8,448	908	3,024	151,734	210,605	198,540	12,065
Delta Air Lines	819,304	949,324	3,271	10,906	—	1,782,805	1,782,805	—
Eastern Air Lines	115,056	1,247	1,215	1,215	—	117,533	115,000	2,533
Northwest Airlines	297,919	3,576	2,475	4,574	—	308,474	284,274	24,200
Trans World Airlines	545,058	30,329	10,355	10,355	—	605,797	571,238	34,559
United Airlines	114,804	10,849	4,898	4,898	—	141,450	136,812	4,638
Western Air Lines	396,020	2,426	2,445	7,429	199,500	608,410	584,318	24,092
Allegiance Airlines	146,523	151,454	6,919	—	—	304,896	302,732	2,164
Capital Airlines	594,509	8,277	3,438	4,908	—	606,134	584,127	22,007
Continental Airlines	181,895	7,833	8,651	8,651	—	198,430	184,274	14,156
Delta Air Lines	404,527	4,844	1,354	1,354	—	410,725	399,318	11,407
HAWAIIAN CARRIERS								
Allegiance Airlines	51,443	5,245	—	5,145	—	56,733	51,443	5,290
Capital Airlines	50,147	604	—	8,345	4,795	63,691	58,147	5,544
CARGO LINES								
American Airlines	—	—	—	141,008	—	141,008	141,008	—
Capital Airlines	—	—	—	1,033,310	—	1,033,310	1,033,310	—
Delta Air Lines	—	—	—	155,501	—	155,501	155,501	—
Northwest Airlines	—	—	—	—	—	—	—	—
Trans World Airlines	—	—	—	—	—	—	—	—
United Airlines	—	—	—	—	—	—	—	—
HELICOPTER SERVICE								
N.Y. Airways	17,057	5,473	9,449	1,849	—	33,828	33,828	—
Los Angeles Airways	5,003	19,487	5,234	—	—	29,724	29,724	—
Helicopter Air Service	—	—	—	—	—	—	—	—

Compiled by AVIATION WEEK from data furnished by Civil Aeronautics Board



BOMBING B-47, 4-JET BOMBER, at the Georgia Division, Lockheed Aircraft Corp., Marietta, Georgia, serviced by G-E Frequency Changer. Package that supplies ground power for testing of electrical control and equipment for radar, radio, and electrical systems.

LOCKHEED AIRCRAFT CORPORATION REPORTS . . .

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43 G-E FREQUENCY CHANGERS NOW IN USE AT MARIETTA, GEORGIA PLANT

Four years ago, Lockheed's Georgia Division purchased their first G-E frequency changer. They were looking for a portable ground power unit to furnish 440-cycle current with close voltage regulation and complete reliability. Results were so satisfactory with this first unit that they immediately placed an order for 20 additional units. Since then, General Electric has delivered 32 more Frequency Changers to Lockheed, bringing the total in use at Marietta to 43. They are used in the laboratory developing and testing new devices on the factory floor where manufacturing, assembly, and modifications are in progress, and on the flight line for checking instruments and electronic equipment.

V. O. CAMPBELL, ELECTRONIC STAFF SPECIALIST AT LOCKHEED says, "We have found in G-E Frequency Changers the high degree of accuracy and complete reliability necessary in the assembly and testing of the B-47s which we are building for the Strategic Air Command of the U.S. Air Force."

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GENERAL  ELECTRIC

CAB ORDERS

GRANTED

Capital Airlines is exception to provide free transportation to technical representatives of Vietnam Airlines, Ltd. and Ruffalo-Russ Ltd.

Leave to intervene in the North Central Life Central application case to Detroit and Detroit Chapter of Commerce.

North Central Airlines permission to serve Chicago O'Hare Airport. North Central is denied authority to serve O'Hare and Midway Airport on the same flight.

Canadian Atlantic Airlines permission to serve Puerto, Puerto Rico.

For American World Airways an exception to prohibit the direct secondary flight between Honolulu and Tokyo, American Samoa. In addition to an scheduled South Pacific service via Canton Island.

Leave to intervene in the case involving operations in Northwest Airlines terminal space between Detroit and Cleveland and Pittsburgh to Capital Airlines, Eastern Air Lines, Trans World Airlines and United Air Lines.

APPROVED

McKee Airlines' last purchase with Northwest Airlines along to purchase of a Convair 440 from Northwest.

Agreements involving Trans World Airlines, Southwest Airlines and various other carriers relating to intercompany agreements, intercompany relationships between Peter Seneca, John Seneca, Peter A. Seneca, Inc. and Trans World Travel Agency. Appointment of Robert W. Clifford and Robert K. DeWolf as the board of directors of Lufthansa Airlines.

ORDERED

Intentional parties allowed to present detailed material and oral argument on the issue of service between First South, A.L., and St. Louis, Mo., by Capital Airlines or Capital Air Lines.

Temporary rates for transportation of service and in the railway U.S. set at the rates proposed by the Board since these rates for the period starting Oct. 1.

Trans-World Airlines authorized to accept service at Columbia, Tex. until arrival deadline at that point is adequate for service in the future.

Business Air Lines' certificate made permanent, effective Jan. 1, 1956, in the form proposed by the Board.

Business Air Lines' temporary authority to transport air mail under its certificate extended for an indefinite period.

South Atlantic' mail rates for domestic shipments set at the rates proposed by the Board to its three carriers for the period starting Dec. 11, 1954.

Modification of a previous Board order approving an International Air Transport Association agreement to carry baggage and cargo included.

South Atlantic' call rates for international operations set at the rates proposed by the Board to its three carriers for the period starting Dec. 15, 1954.

DENIED

North Central Airlines' application for temporary transportation to provide air service between Midway and O'Hare Airports.



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"with what" part of
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Capital Promotes Theatre Charters

Washington—Capital Airlines has started a novel promotion campaign with a theatre shift. Capital carried three place-books of theatre guests from Pittsburgh to New York in a Show Place package deal that included four Broadway shows and other entertainment.

The airline is paying local theatre groups and newspapers in a campaign to try markets which have been successfully pioneered by the railroad in the past.

According to Capital's assistant sales manager, Hugh Jones, the first theatre trip was well received, and the airline plans a systematic program of trips from points outside the New York area.

The first Show Place was a \$89.15 package trip in early October offered by Capital in conjunction with the Pittsburgh Post-Gazette and the Council of the Living Theatre. The 180-passenger limit was subscribed only in the promotion campaign, and 274 applications had to be returned.

View Four Shows

For the \$89.15 fee, the Pittsburgh member got three shows in New York with all expenses paid except meals included in the package were orchestra seats to four Broadway shows chosen by the donors of the Post-Gazette, saving the passenger a break with the inevitable ticket scalper often encountered by visitors to New York.

The theatre shift—three DC-4s—left Pittsburgh at noon Monday. Passengers landed on the airfield, and checked into the Statler Hotel on arrival in New York. They attended a cocktail party Monday evening to get acquainted with each other and met most of some of the shows they were to see. Later, they attended "Cat on a Hot Tin Roof."

The Tuesday program featured a special luncheon at Seely's, a theatre symposium, and saw "Pete and Gatsby" in the evening.

On Wednesday, the Pittsburghers saw a matinee of "Thru the Yarns," checked out of the hotel, then went to an evening performance of "Whimsy for the Preservation" while Capital transferred their luggage to the airport for the return trip to Pittsburgh. About a third of the group elected to delay their return home, which they could do under the terms of the Show Place package.

Plan Future Trips

Between the scheduled events, the Pittsburgh group was in its own for meals, sightseeing and any other entertainments.

Capital ran the trip as a cost operation, figuring the profit lies in the promotion for the airline. The carrier made all arrangements for transportation, hotels and the program of events. Besides those participants in the theatre trip has been very good, several to Capital, and plans are being made for future trips. The weekly flight help Capital during the slack days of the week, and the theatre operation like them for the same reason. Theatre people also look forward to the trips as shortcuts for business during the normally slack summer season.

The next trip is scheduled for early December from Canton and Akron, Ohio, in conjunction with the Canton Playhouse Guild, and Capital is working on a trip from Flint, Mich., in January.

SHORTLINES

► **Air Transport** Ann. reports U.S. scheduled airlines flew 212,454,000 enroute ton-miles in September, an increase of 17.2% over September, 1954. Traffic for the first nine months of this year was 2,113,117,000 enroute ton-miles, 19.4% more than the same period last year. Passenger ton-miles for the year ending October, 1955, was 63 per cent (68 million passenger-miles). Domestic rate was 74 and the international rate 95.

► **British European Airways** reports a 34% increase in traffic last September. In the year ending Sept. 30, 1955, BEA carried 2,110,000 passengers, 667,500 (80 passenger-miles at load factor of 79.4%.

► **Flying Tiger Line** flew 5,565,551 ton-miles of traffic in October, an increase of 92% over the previous October. FTL, operated 47,997,415 ton-miles in the first ten months of the year, 57% more than the same period of 1954.

► **Quaker Empire Airways** has introduced tourist fares to its Sidney-Johnsburgh services with combination train Super Connections. Flights leave Sidney and Johnsburgh only other week.

► **Schotland and Western Airlines** flew 18,911,000 freight ton-miles in the first ten months of the year, a 45% gain over the same period last year.

► **United Air Lines** reports second traffic of 162,740,000 passenger-miles for October, a 16% increase over October, 1954, traffic.

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2	ALCOA-Thomas B. Brown & Ray Co.	52	GAUGHERS ALBERTSON CORP
3	ALCOA-Thomas B. Brown & Ray Co.	53	GAUGHERS ALBERTSON CORP
4	ALCOA-Thomas B. Brown & Ray Co.	54	GAUGHERS ALBERTSON CORP
5	ALCOA-Thomas B. Brown & Ray Co.	55	GAUGHERS ALBERTSON CORP
6	ALCOA-Thomas B. Brown & Ray Co.	56	GAUGHERS ALBERTSON CORP
7	ALCOA-Thomas B. Brown & Ray Co.	57	GAUGHERS ALBERTSON CORP
8	ALCOA-Thomas B. Brown & Ray Co.	58	GAUGHERS ALBERTSON CORP
9	ALCOA-Thomas B. Brown & Ray Co.	59	GAUGHERS ALBERTSON CORP
10	ALCOA-Thomas B. Brown & Ray Co.	60	GAUGHERS ALBERTSON CORP
11	ALCOA-Thomas B. Brown & Ray Co.	61	GAUGHERS ALBERTSON CORP
12	ALCOA-Thomas B. Brown & Ray Co.	62	GAUGHERS ALBERTSON CORP
13	ALCOA-Thomas B. Brown & Ray Co.	63	GAUGHERS ALBERTSON CORP
14	ALCOA-Thomas B. Brown & Ray Co.	64	GAUGHERS ALBERTSON CORP
15	ALCOA-Thomas B. Brown & Ray Co.	65	GAUGHERS ALBERTSON CORP
16	ALCOA-Thomas B. Brown & Ray Co.	66	GAUGHERS ALBERTSON CORP
17	ALCOA-Thomas B. Brown & Ray Co.	67	GAUGHERS ALBERTSON CORP
18	ALCOA-Thomas B. Brown & Ray Co.	68	GAUGHERS ALBERTSON CORP
19	ALCOA-Thomas B. Brown & Ray Co.	69	GAUGHERS ALBERTSON CORP
20	ALCOA-Thomas B. Brown & Ray Co.	70	GAUGHERS ALBERTSON CORP
21	ALCOA-Thomas B. Brown & Ray Co.	71	GAUGHERS ALBERTSON CORP
22	ALCOA-Thomas B. Brown & Ray Co.	72	GAUGHERS ALBERTSON CORP
23	ALCOA-Thomas B. Brown & Ray Co.	73	GAUGHERS ALBERTSON CORP
24	ALCOA-Thomas B. Brown & Ray Co.	74	GAUGHERS ALBERTSON CORP
25	ALCOA-Thomas B. Brown & Ray Co.	75	GAUGHERS ALBERTSON CORP
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46	ALCOA-Thomas B. Brown & Ray Co.	96	GAUGHERS ALBERTSON CORP
47	ALCOA-Thomas B. Brown & Ray Co.	97	GAUGHERS ALBERTSON CORP
48	ALCOA-Thomas B. Brown & Ray Co.	98	GAUGHERS ALBERTSON CORP
49	ALCOA-Thomas B. Brown & Ray Co.	99	GAUGHERS ALBERTSON CORP
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Radioactive Role for Civil Air Patrol

Less than 45 minutes after the 35 lifeline nuclear blast of Operation One shattered the desert dunes of Yucca Flat last spring, a mission Strain piloted by William Strain, operations officer of the Nevada Civil Air Patrol, flew low altitude precision passes over the radioactive ruins of the ghost town built for Civil Defense tests. Around Strain's Strain were two technicians carrying radiation detection instruments to measure the intensity and scope of the atomic blast's after effects. This was the first use of a civilian aircraft on a radiological survey mission. Its success opened a new and vital role for the Civil Air Patrol.

Oak Ridge Search

A few months ago officials of the Atomic Energy Commission's Oak Ridge National Laboratory conducted another test in which Civil Air Patrol planes were given the job of detecting a live radioactive target scattered within a 12-mile radius of the laboratory. With 20 CAP lightplanes participating, each carrying an Atomic Energy Commission technician carrying airborne radiological survey instruments, the target was located, its level and perimeter of radiation measured and the information transmitted to ground crews who marked and isolated the contaminated area.

All of this was done in less than 35 hours total flying time by the CAP fleet.

After the Oak Ridge test Dr. K. Z. Morgan, director of the Health Physics Division at Oak Ridge, said, "It was confirmed that an survey by organizations such as the Civil Air Patrol is the only practical way of locating rapidly large quantities of fallout material associated with military use of atomic weapons in time of war or with accidents involving large quantities of radioactive fallout material."

"During the past 12 years I have been concerned with the problems of fallout and surface contamination from radioactive materials. I believe these problems can be resolved adequately in time of peace and war if civilian groups such as the Civil Air Patrol are adequately trained and equipped to locate and appraise the hazard."

Equipment Program

Civil Air Patrol is now embarked on a program to develop its radiological survey capacity. Maj. Gen. Louis V. Bass, who recently retired as national commander of the CAP, reports that its Illinois wing has begun to equip planes in Chicago with radiation detec-

tion instruments and to train crews in their use. Similar programs are scheduled for Wisconsin and Oklahoma CAP wings in co-operation with state Civil Defense authorities.

Although these preliminary tests of aerial radiological survey techniques indicate that much improvement is necessary both in airborne instruments and in plotting and communication procedures, they also have shown that the Civil Air Patrol has an opportunity to add a new and vital role to its already substantial reputation of emergency type operations.

CAP now flies about 63% of the hours devoted annually to air search and rescue in the United States and has been perfecting its technique on disaster evacuation and emergency aid for many years. Among its most spectacular demonstrations of the effectiveness of these operations were the airlifting of 1,700 parts of whole blood into a 900-ft. long athletic field in downtown Washington and the transport of a 16-bed field hospital into the Philadelphia Navy Yard to cope with simulated atomic disasters. All of these operations were conducted with plane types ranging from the smallest Piper to nothing larger than a Twin Beech.

5,300 Planes

In its post-war period, the Civil Air Patrol has grown to an organization of nearly 90,000 members including 51,000 cadets. It has 12,756 rated pilots and operates approximately 5,300 planes and 10,000 radio facilities. About 4,800 of its planes are owned by corporations or individuals and include the Beechcrafts, Cessna, Piper and Mooney that are standard types in the growing fleet of business and pleasure planes. The Air Force has contributed some 500 surplus liaison planes for CAP use.

All of the CAP members serve without pay, buy their own equipment and pay a large part of the operational costs for their aircraft out of their own pockets. USAF pays for fuel and oil expended by CAP planes on missions specifically requested by the military services.

The CAP cadet program for boys and girls over 15 is one of the most effective organizations for keeping alive the unending spirit of youth that is so essential to maintain our aviation leadership.

It would be hard to find another group in aviation who are providing a more effective demonstration of the utility of light aircraft or a more selfless devotion to the job of helping their fellow citizens in distress.

—Robert Hertz



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